



Echo Lake Pre-Dredging Study

City of Burlington
Racine County, Wisconsin

Prepared for:

City of Burlington

June 2021

Echo Lake Pre-Dredging Study

**City of Burlington
Racine County, WI**

June 2021



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Ayres Project No. 26-1258.00

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1. Introduction

Echo Lake is 70-acre reservoir that is fed by the White River and Honey Creek. The lake is controlled by the 300-foot-long Burlington (Echo Lake) Dam located at the southeast end near the Milwaukee Avenue bridge. After leaving the dam, the White River joins the Fox River approximately 0.25 miles downstream.

The City of Burlington is considering adaptive management options to control phosphorus levels in its waterways. One option of interest is possibly dredging Echo Lake to remove phosphorus-contaminated sediments. Sediment removal may also have a secondary benefit of improving recreational opportunities in Echo Lake. Ayres was retained to complete a pre-dredging study which included surveying the impoundment, estimating sediment volumes, estimating the total phosphorus load, and identifying other significant contaminants within the sediment.

A sediment sampling plan was prepared and submitted to the Wisconsin Department of Natural Resources (DNR) on April 13, 2021. Ayres requested follow up on April 26th and 28th prior to the scheduled survey but no response was provided.

2. Survey Conditions

The bathymetric survey and sampling were completed on April 29, 2021 with Ayres arriving onsite at 9:30 AM and departing around 4:45 PM. *Table 1* lists the Milwaukee Mitchell International Airport weather during the survey period.

Table 1. Milwaukee International Airport weather during the survey period

April 29, 2021	
Precipitation	0
Maximum temperature	62 F
Minimum temperature	53 F
Maximum windspeed	12 mph

Ayres was unable to survey the entire lake due to shallow water depths and/or obstructions (e.g., fallen trees along the shore). Generally, shallow areas with less than 1 foot of water depth were not surveyable. Ayres did attempt to survey the outer limits of the shallow areas so that their extents would be accurately represented in the lake bathymetry.

3. Survey Methods and Data Processing

Ayres survey equipment used to complete the survey are presented in *Table 2*.

The depth soundings were obtained using a dual-frequency echosounder that was positioned with a submeter global positioning system (GPS). The collected soundings were displayed in real time by Hypack Max 2021 to provide quality control of collected data. Over 10,000 depth soundings were collected during the survey but approximately 2,200 soundings were filtered out during post processing. Soundings were filtered first in Hypack Max to remove excessive bed roughness, fish and water column obstructions, anomalous propagation (multiple reflections of sonar beam off bed and water surface), and other common hydrographic survey errors.

Table 2. Equipment used during survey of Echo Lake

Survey Equipment	
Echosounder	Sonarmite DFX 200kHz/33kHz
Connection Method	RS232 / Hypack Max 2021
Positioning	Trimble GeoXH GNSS
Land Survey	Trimble Geo7x RTK
Boat Length	14 feet
Boat Motor	8HP Mercury
Sediment Sampler	AMS Multistage Sampler
Sediment Probes	Survey Range Poles

In *Figure 1*, the blue dots are 33-kilohertz data points, which tend to penetrate leaf litter and sediment fluff, while the red dots show 200-kilohertz data points that do not penetrate into the bed. Sediment fluff is the detritus, finer silty sediment, and biota that has the consistency of thick soup. Generally, the 200-kilohertz signal will bounce off the fluff while the 33-kilohertz signal tends to have a peak return from the slightly more compacted sediment. A depth check was done multiple times with a survey rod to confirm the 33-kilohertz depth readings were correctly recorded in Hypack.

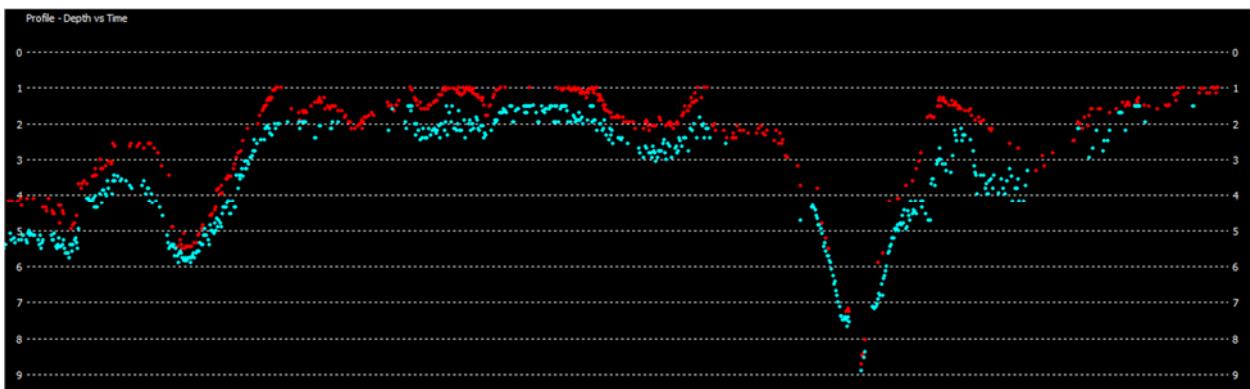


Figure 1. Single Beam Max showing dual-frequency echosounder soundings plotting depth over time

The processed data were then exported to a comma-separated values file and Excel was used to correct for the draft of the sounder from the water surface and to convert the depth soundings into elevations. The sounder was positioned below the water surface approximately 9 inches while surveying. Each depth was increased by 9 inches and then subtracted from the surveyed water surface elevation of 762.15 feet NAVD88. The water surface elevation was obtained by using the Trimble Geo7x RTK survey grade GPS. The nearby NGS benchmark located on the dam was also shot to confirm the water surface accuracy.

The last step in processing was to import all the Excel data to AutoCAD 2018 Civil 3D to add the water's edge breaklines (based on 2010 Racine County 2-ft contour LiDAR data), structure breaklines (edges of the dam), and island breaklines. After using breaklines, data points are replotted to check for anomalies like shoreline zigzags that reflect lateral transects or spikes in contours where two transects cross and have slightly different elevations. These artificial surface flaws are corrected by deleting the points thought to be least reliable or adding breaklines to eliminate excessively narrow triangulation.

After the data set produces a reasonable set of contours, the jaggedness of contours is removed through gridding. This final process helps create smoother 1-foot contours. The final bathymetric map is shown in Appendix A. In general, depths in the lake average about 2 feet.

4. Sediment Sampling Results

Six samples were collected during the survey with an AMS multistage sediment sampler. Pace Analytical Laboratories in Green Bay were retained to conduct the sediment testing. Pace provided the necessary sample collection jars/bags and transportation cooler to facilitate the sampling. All samples were delivered to Pace on ice the same day as collected. Sample locations are shown in the Appendix A 2021 *Probe and Samples Map* drawing.

Samples #1 and #4 were collected near or within the assumed original lake bed, and samples #2 and #5 were collected in sediment that is likely to be dredged. Samples #3 and #6 were also collected in sediment that is likely to be dredged but were only tested for phosphorus, while the remaining samples were tested for all the proposed analytes including phosphorus (see the Sediment Sampling Plan in Appendix B). The summarized sampling results that were entered into the DNR's residual contaminant levels (RCLs) spreadsheet are shown in *Table 3*, and the complete sampling report created by Pace is provided in Appendix B.

The testing results showed several metals above Groundwater RCL (*italic red*), but there are no exceedances detected for non-industrial or industrial RCLs. The Cumulative Risk Calculation does not appear to propose any concern either, but the full sampling results will be submitted to the DNR for review and final determination of direct contact risks.

5. Sediment Volume

Sediment depth was estimated by pushing survey range poles into the sediment until refusal. The depths were measured from the water surface and recorded with the Trimble GeoXH GPS. The depths were later converted into elevations in Excel and imported into AutoCAD 2018 Civil 3D to create a refusal surface.

A volume computing comparison surface was created to estimate the total sediment in the entire lake from the boat landing on Bieneman Road to the dam. This surface was created by comparing the very top of the sediment (red dots, 200kHz) to the refusal surface (probes), which calculated approximately 279,645 cubic yards of accumulated material.

Two more volume computing comparison surfaces were created to estimate the volumes of potential dredge material. For these computations, we considered a feasible dredging area to be the lake from the railroad trestle to the dam. Within this dredging area, we set the dredged lake bottom elevation to a uniform 758.0 ft, which would result in approximately 4 ft of water depth throughout. The first surface was the very top of sediment (red dots, 200kHz) compared to the proposed dredge contours which calculated approximately 130,482 cubic yards of material that could be dredged. This volume includes the top sediment fluff that would likely compact down or be flushed out of the reservoir during drawdown. The second surface of the slightly more compacted sediment (blue dots, 33kHz) was compared to the proposed dredge contours which calculated approximately 99,980 cubic yards of material. Ayres used the average volume of 115,231 to estimate the sediment that could be dredged for recreational purposes and phosphorus removal.

Table 3. Summarized sediment sampling results for Echo Lake

Summary of Soil Analytical Results Echo Lake Pre-Dredging Study											
	Samples						NR 720 WDNR Spreadsheet RCLs				
	1		2		3		4	5	6		
	Lake Bed	Sediment	Sediment	Lake Bed	Sediment	Sediment	Date	4/29/21	4/29/21	4/29/21	
	Soil Type	Silt	Silt	n/a	Silt	Silt		n/a			
Parameter	CAS						Non-industrial Direct Contact	Industrial Direct Contact	Protection of Ground Water	Back Ground Threshold Value	
Metals											
Arsenic	7440-38-2	6.5	7.0	--	5.5	8.0	--	0.677	3	0.584	8
Barium	7440-39-3	134	97.0	--	134	109	--	15,300	100,000	164.8	364
Cadmium	7440-43-9	12 J	1.3 J	--	0.58 J	0.48 J	--	71.1	985	0.752	1
Chromium	7440-47-3	24.8	51.1	--	23.7	26.9	--	100,000	100,000	360,000	44
Copper	7440-50-8	15.8	15.1	--	16.5	16.1	--	3,130	46,700	92	35
Lead	7439-92-1	18.7	18.1	--	24.3	26.9	--	400	800	27	52
Manganese	7439-96-5	744	477	--	654	473	--	1,830	--	--	2,937
Mercury	7439-97-6	0.17	0.18	--	0.21	0.19	--	3.13	3.13	0.208	---
Nickel	91-20-3	16.9	56.6	--	16.6	27.5	--	1,550	22,500	13,061	31
Selenium	7782-49-2	3.7	3.1	--	2.9	2.7	--	391	5,840	0.52	---
Zinc	7440-66-6	74.7	63.5	--	79.6	76.0	--	23,500	100,000	--	150
Nutrients											
Phosphorus	7723-14-0	965	1330	1710	738	803	873	--	--	--	---
Nitrogen, Ammonia	7664-41-7	293	621	--	468	264	--	--	--	--	---
Nitrogen, Kjeldahl, Total	7727-37-9	4380	5090	--	4360	4000	--	--	--	--	---
Mean Total Organic Carbon	7440-44-0	46900	66200	--	52400	46300	--	--	--	--	---
Total Organic Carbon	7440-44-0	48000	78200	--	55300	47400	--	--	--	--	---
Polychlorinated Biphenyls (PCBs)											
PCB, Total	1336-36-3	<0.0319	<0.0400	--	<0.0304	<0.0309	--	--	--	--	---
PCB-1016 (Aroclor 1016)	12674-11-2	<0.0319	<0.0400	--	<0.0304	<0.0309	--	4.11	51.30	--	---
PCB-1221 (Aroclor 1221)	11104-28-2	<0.0319	<0.0400	--	<0.0304	<0.0309	--	--	--	--	---
PCB-1232 (Aroclor 1232)	11141-16-5	<0.0319	<0.0400	--	<0.0304	<0.0309	--	--	--	--	---
PCB-1242 (Aroclor 1242)	53469-21-9	<0.0319	<0.0400	--	<0.0304	<0.0309	--	--	--	--	---
PCB-1248 (Aroclor 1248)	12672-29-6	<0.0319	<0.0400	--	<0.0304	<0.0309	--	--	--	--	---
PCB-1254 (Aroclor 1254)	11097-69-1	<0.0319	<0.0400	--	<0.0304	<0.0309	--	1.17	14.70	--	---
PCB-1260 (Aroclor 1260)	11096-82-5	<0.0319	<0.0400	--	<0.0304	<0.0309	--	--	--	--	---
Polycyclic Aromatic Hydrocarbons (PAHs)											
1-Methylnaphthalene	90-12-0	<0.0051	<0.0064	--	0.0243 J	<0.0050	--	4,180	52,700	--	---
Acenaphthene	83-32-9	<0.0045	<0.0057	--	<0.0043	<0.0044	--	3,590	45,200	--	---
Acenaphthylene	208-96-8	<0.0044	<0.0055	--	0.0055 J	<0.0043	--	--	--	--	---
Anthracene	120-12-7	<0.0045	0.0241 J	--	0.0098 J	0.0350	--	17,900	100,000	196,94915	---
Benz(a)anthracene	56-55-3	<0.0040	0.0202 J	--	0.0055 J	0.0356	--	1.14	20.8	--	---
Benzo(a)pyrene	50-32-8	<0.0049	0.0250 J	--	0.0103 J	0.0511	--	0.115	2.11	0.47	---
Benzo(b)fluoranthene	205-99-2	<0.0041	0.0143 J	--	0.0055 J	0.0258 J	--	1.15	21.1	0.4780876	---
Benzo(g,h,i)perylene	191-24-2	<0.0061	0.0129 J	--	<0.0056	0.0234 J	--	--	--	--	---
Benzo(k)fluoranthene	207-08-9	<0.0045	0.0137 J	--	0.0045 J	0.0182 J	--	11.5	211	--	---
Chrysene	218-01-9	<0.0066	0.0248 J	--	0.0095 J	0.0402	--	115	2110	0.1442231	---
Dibenz(a,h)anthracene	53-70-3	<0.0048	<0.0061	--	<0.0046	0.0074 J	--	0.115	2.11	--	---
Fluoranthene	206-44-0	<0.0041	0.00548	--	0.0282 J	0.0859	--	2,390	30,100	88,877805	---
Fluorene	86-73-7	<0.0042	<0.0052	--	0.0094 J	<0.0041	--	2,390	30,100	14,829932	---
Indeno(1,2,3-cd)pyrene	193-39-5	<0.0073	0.0115 J	--	<0.0070	0.0220 J	--	1.15	21.1	--	---
Naphthalene	91-20-3	<0.0034	<0.0043	--	0.0232 J	<0.0033	--	5.52	24.1	0.6581818	---
Phenanthrene	85-01-8	<0.0040	0.0328 J	--	0.0242 J	0.0386	--	--	--	--	---
Pyrene	129-00-0	<0.0051	0.0450	--	0.0223 J	0.0697	--	1,790	22,600	54,545455	---
Cumulative Risk Calculation (Non-Industrial Direct Contact)											
Exceedances	0	0	--	0	0	--	1	1	--	--	---
Hazard Index	0.0724	0.1193	--	0.0546	0.0550	--	1	1	--	--	---
Cancer Risk	1E-06	15E-06	--	1E-06	1E-04	--	1.00E-05	1.00E-05	--	--	---

Notes:
 Samples 3 and 6 only analyzed for Phosphorus
 J = Estimated concentration at or above the Limit of Detection and below the Limit of Quantification
 < = less than detection limit (analyte not detected)
 Groundwater RCL exceedances are in *italic red* font
 Non-Industrial Direct Contact RCL exceedances are in **bold red** font
 Industrial RCL exceedances are boxed.

6. Phosphorous Load

A total of six samples were tested for phosphorus with two of the samples collected in assumed lake bed material and four samples located in more recently deposited sediment that could potentially be dredged. Sample 6 was taken upstream of the railroad bridge and the current dredging plans do not propose dredging upstream of the bridge. The phosphorus testing results of the three sediment samples within the proposed dredge area showed an average of 1,281 mg/kg of phosphorus within the sediment. Ayres estimates approximately 502,000 pounds of phosphorous will be removed if 115,231 cubic yards of

sediment is dredged from the impoundment. The calculation is shown in *Table 4* and provided in Appendix B.

Table 4. Estimated phosphorus load within proposed dredged sediment

Dredge volume estimate	115,231 cy	(average of 33/200kHz sediment surfaces)
Avg sediment density	2,018 kg/m ³	(average value from "Earth Manual" correlating to testing results)
Phosphorus in sediment	1,281 mg/kg	(average of 3 sediment samples within dredge area (not lake bed samples))
Phosphorus Load Estimate Calculation	115,231 cy 88,100.42 m ³ 177,786,649.26 kg 227,744,697,701.49 mg	x 0.764554858 m ³ /cy = 88,100.42 m ³ x 2,018 kg/m ³ = 177,786,649.26 kg x 1,281 mg/kg = 227,744,697,701.49 mg x 0.000002204 lb/mg = 501,949.31 lb of phosphorus in sediment

7. Opinion of Probable Cost

The Opinion of Probable Costs is based on dredging the main portion of Echo Lake from the railroad trestle to Milwaukee Avenue and the dam. At this time, Ayres anticipates that dredging upstream of the railroad bridge may be infeasible because it would increase the total project cost significantly. The railroad trestle has insufficient clearance to allow contractors to mobilize between upstream and downstream dredging areas. Therefore, two separate offloading and staging areas would likely be required, which would result in significant additional mobilization costs. However, if the City is interested in dredging upstream of the railroad trestle, Ayres can provide sediment volume and phosphorus loading calculations to support the expanded scope.

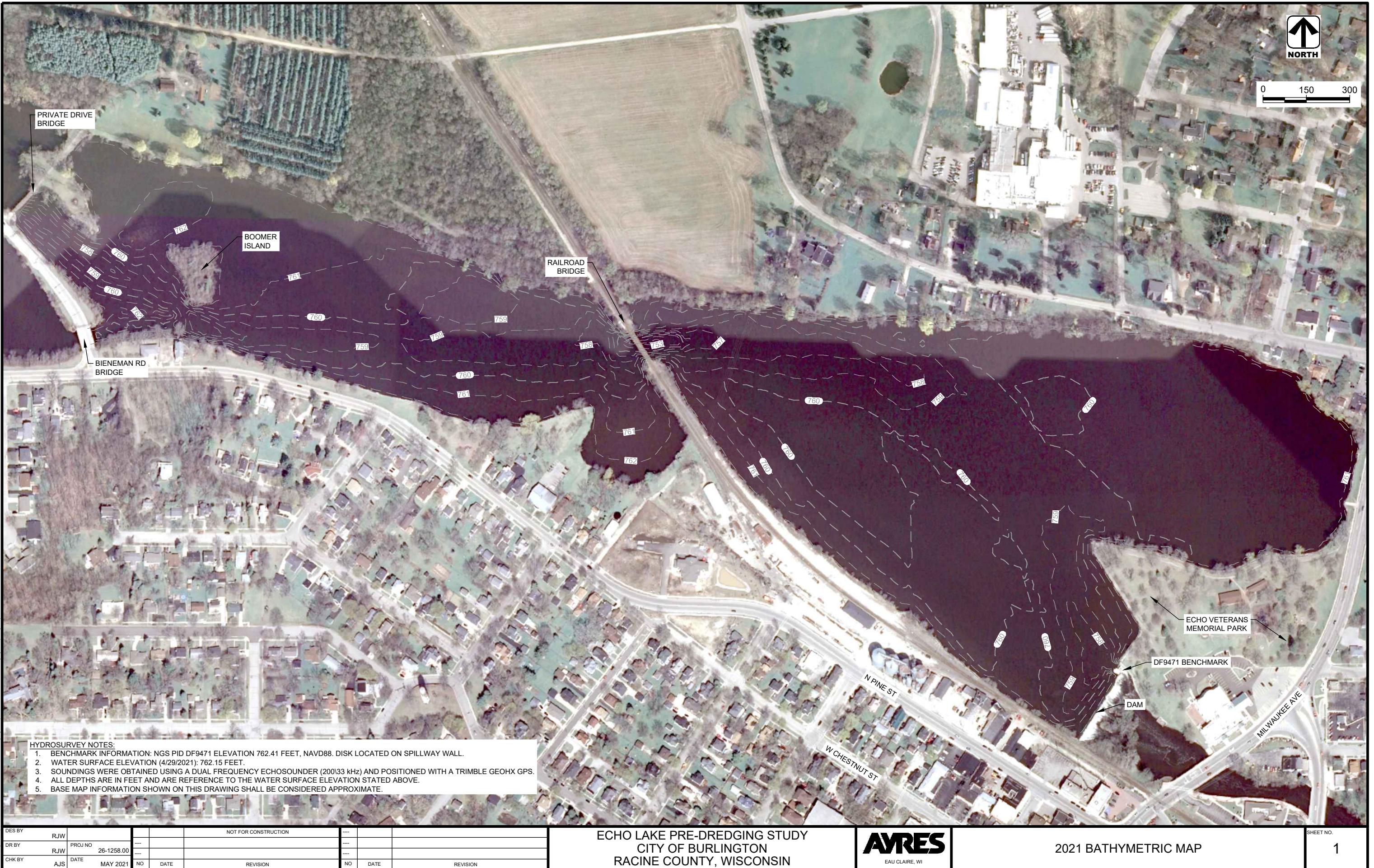
The dredge area as shown in the *Proposed Dredge Map* drawing (Appendix A) depicts a dredge bottom elevation of 758.0 ft which would provide approximately 4 feet of water depth in the lake between the trestle and the dam. Elevation 758.0 ft was also proposed because it was the sediment probe elevation where most refusals occurred. The DNR does not allow dredging within 10 feet of the shoreline. This no-dredge buffer allows for fish and other aquatic animals' habitat to remain undisturbed. Ayres recommends extending the no dredge buffer to 15 feet to account for LiDAR inconsistencies and to provide the contractor some leeway to maintain the minimum buffer distance. The dredging side slope starts at the edge of the 15-foot no-dredge buffer and extends 3 feet horizontal to 1 foot vertical until reaching the dredge bottom elevation of 758.0 ft.

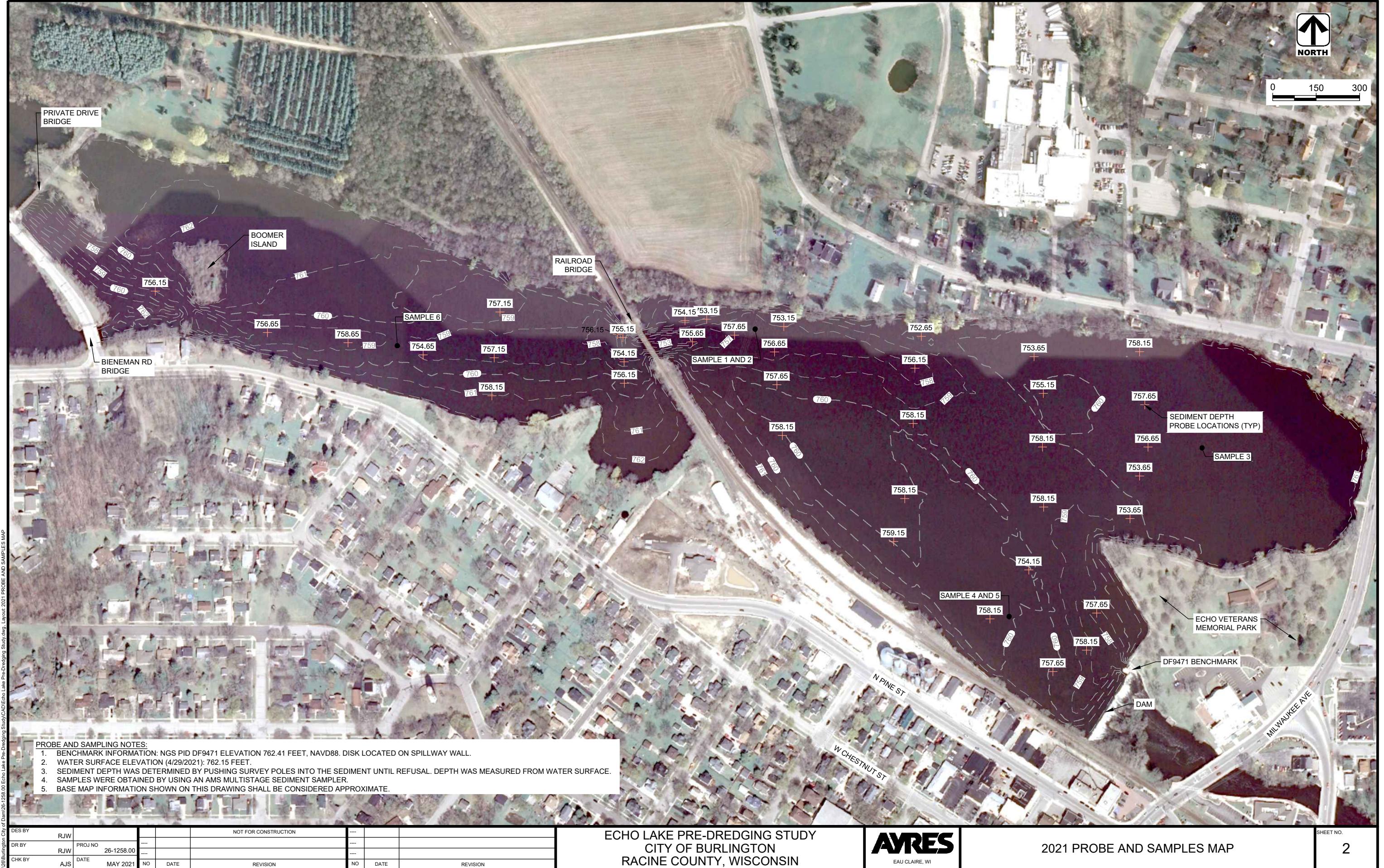
This Opinion of Probable calculation breakdown is provided in *Table 5*. As shown, Ayres estimates the total cost to dredge the lake as described above to be approximately \$2.5 million. The cost estimate is based on RS Means Heavy Construction Cost Data from 2020, but the resulting cost per cubic yard of sediment removal (about \$22 per cubic yard) is consistent in magnitude with what we have encountered for other local and comparable dredging projects. The cost estimate assumes mechanical dredging in the winter after the lake has been drawn down, and that the City will secure a nearby offloading and staging area and a disposal site within 2 miles of the lake. Several other Ayres dredging clients have found local farmers willing to accept the nutrient-rich sediment to be spread on agricultural fields. The sediment testing results indicate that disposal of dredged sediments on agricultural fields should be acceptable as no dangerous levels of contamination were encountered. However, the DNR must ultimately approve of any disposal sites chosen for the project.

Table 5. Opinion of probable cost for dredging

Opinion of Probable Cost											
May-21											
Project: Echo Lake Pre-Dredging Study											
Client: City of Burlington											
Location: Racine County, WI											
Project No.: 26-1258.00											
References: 1.) Heavy Construction Cost Data, RSMeans, 34th Annual Edition, 2020.											
RS Means Item Number and Description			Unit	Quantity	2020 Bare Costs						
					Material	Labor	Equipment	Total	Total Incl O&P	Total Item Cost Incl O&P	Notes:
Division 35-Waterway and Marine											
35 24 23.13 Dredging											
1100 Mobilization	Total	1			31,000	29000.00	60,200		78,500	\$ 78,500.00	*assumes nearby offloading site
0510 Mechanical dredging	C.Y.	115231			4.85	3.35	8.20		12.1	\$ 1,394,295.10	
Division 31 - Earthwork											
31 23 23.20 Hauling											
1050 12CY truck, 30 mph, cycle 4 miles	C.Y.	115231			1.55	2.27	3.82		4.83	\$ 556,565.73	*assumes clean sediment & nearby farm field for disposal
Misc											
Offloading Site Preparation	L.S.	1								\$ 10,000.00	
Offloading Site Restoration	L.S.	1								\$ 5,000.00	
										\$ 2,044,360.83	

Appendix A: Drawings





PROBE AND SAMPLING NOTES:

1. BENCHMARK INFORMATION: NGS PID DF9471 ELEVATION 762.41 FEET, NAVD88. DISK LOCATED ON SPILLWAY WALL.
 2. WATER SURFACE ELEVATION (4/29/2021): 762.15 FEET.
 3. SEDIMENT DEPTH WAS DETERMINED BY PUSHING SURVEY POLES INTO THE SEDIMENT UNTIL REFUSAL. DEPTH WAS MEASURED FROM WATER SURFACE.
 4. SAMPLES WERE OBTAINED BY USING AN AMS MULTISTAGE SEDIMENT SAMPLER.
 5. BASE MAP INFORMATION SHOWN ON THIS DRAWING SHALL BE CONSIDERED APPROXIMATE.

WA-Standard.stb
15/10/01

A-Standard.st
15/3/2021

DES BY	RJW			NOT FOR CONSTRUCTION	---		
DR BY	RJW	PROJ NO	26-1258.00	---	---	---	---
CHK BY	AJS	DATE	MAY 2021	NO	DATE	REVISION	NO
							REVISION

ECHO LAKE PRE-DREDGING STUDY
CITY OF BURLINGTON
RACINE COUNTY, WISCONSIN



2021 PROBE AND SAMPLES MAP

2



Appendix B: Sediment Sampling Information

From: [Wayne, Robert](#)
To: ["theresa.alvarez@wisconsin.gov"](#)
Cc: [Schneider, Adam](#); ["priggs@burlington-wi.gov"](#)
Subject: FW: Echo Lake Sampling Plan - City of Burlington
Date: Monday, April 26, 2021 10:29:00 AM
Attachments: [Echo Lake Sampling Plan.pdf](#)
[image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)

Hi Theresa,

We are looking at surveying and sampling on Thursday 4/26. Do you have any modifications to the sampling plan?

Thanks,

Rob

Robert J Wayne

Environmental Scientist

Ayres Associates Inc

Office: 715.834.3161 | **Direct:** 715.831.7506

WayneR@AyresAssociates.com

www.AyresAssociates.com

From: Wayne, Robert

Sent: Tuesday, April 13, 2021 4:08 PM

To: theresa.alvarez@wisconsin.gov

Cc: Schneider, Adam <SchneiderA@ayresassociates.com>; priggs@burlington-wi.gov

Subject: Echo Lake Sampling Plan - City of Burlington

Hi Theresa,

Please see the attached sediment sampling plan for Echo Lake in the City of Burlington.

Let us know if you have any questions.

Thanks,

Rob



Robert J Wayne | Environmental Scientist

Office: 715.834.3161 | **Direct:** 715.831.7506

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Ingenuity, Integrity, and Intelligence.

April 13, 2021

Theresa Alvarez
Wisconsin Department of Natural Resources
Milwaukee Service Center
2300 North Dr Martin Luther King Jr Drive
Milwaukee, WI 53212

Submitted via email: theresa.alvarez@wisconsin.gov

Subject: Echo Lake Sampling Plan, Racine County

Dear Ms. Alvarez,

The purpose of this letter is to submit a sampling and analysis plan for the dredging of Echo Lake in the City of Burlington, Wisconsin. The City of Burlington is considering adaptive management options to control phosphorus levels in its waterways. One option of interest is possibly dredging Echo Lake to remove phosphate-contaminated sediments. Sediment removal may also have a secondary benefit of improving recreational opportunities in the lake. The sampling is planned to occur concurrently with a sediment profile survey which we are tentatively planning on the week of April 26, 2021. The sediment profile survey will provide a basis for estimating a potential volumetric range of sediment that could be dredged from Echo Lake.

Please approve or advise modifications to the attached sediment sampling and analysis plan.

If the plan is approved, the completed sampling report and analytical results will be submitted to your office.

Sincerely,

Ayres Associates Inc



Adam Schneider, PE
Project Manager
920-327-7842
SchneiderA@AyresAssociates.com

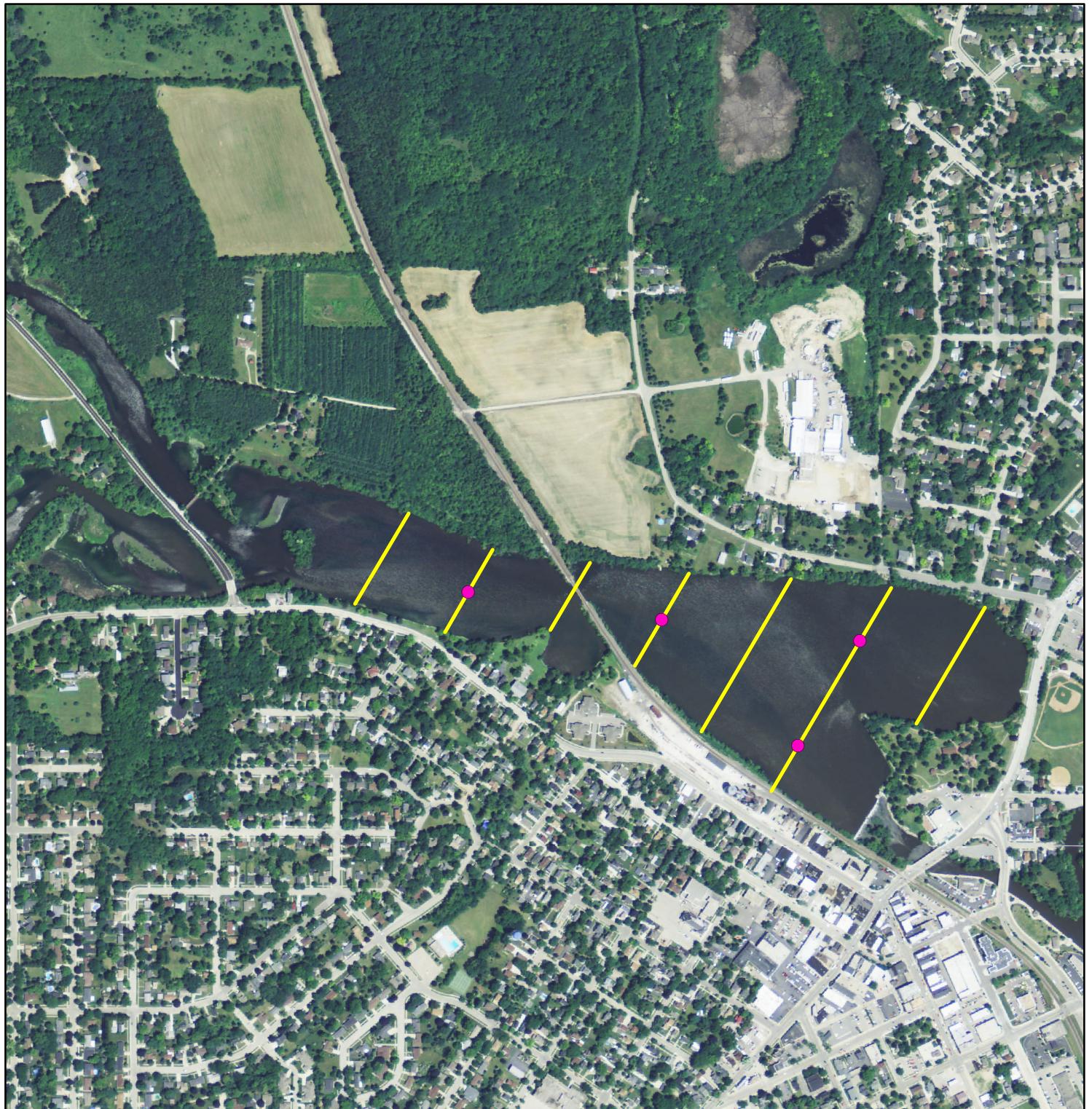
Sediment Sampling and Analysis Plan Echo Lake – Burlington, WI

Preliminary Application Summary, per NR 347.05:

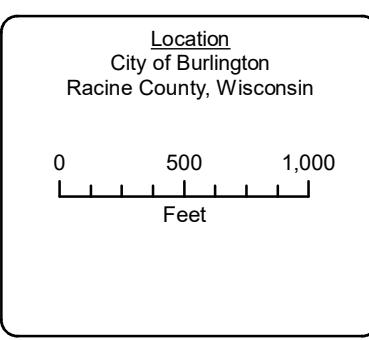
- Name of waterbody and project location:
 - Echo Lake— Located in the City of Burlington
- Volume of material to be dredged:
 - Purpose of this study is to determine the volumetric build-up of sediment in Echo Lake to more accurately determine amount of sediment that could be dredged.
- Dredging method and disposal method:
 - Mechanical dredging is assumed method. The City of Burlington is currently looking into disposal site options.
- Brief description of known historical chemical use in the waterbody for vegetation / algae control, including year, chemical, and amount applied:
 - It is unknown if chemicals were previously used to treat Echo Lake.
 - Most land in the Echo Lake watershed is agriculture (44.8%), forest (14.4%), wetland (11.3%) and other uses (29.5%).
- Any previous sediment sampling:
 - Unknown.
- Copy of a map showing area to be dredged, depth of cut, and proposed sediment sampling site, bathymetry of area to be dredged:
 - See attached map for proposed sediment sampling locations and cross sections for probing sediment depths. Exact locations may vary due to field conditions. Bathymetry of existing Echo Lake will be mapped during the sediment sampling work.
- Anticipated starting and completion dates of the proposed project:
 - Preliminary Design by September 2021

Sampling and Analysis Plan:

- Parameters to be analyzed for, including analytical methods and detection levels:
 - See highlighted rows in attached Table 1.
- Planned sample and cross section locations:
 - We plan to collect sediment and lakebed samples at 2 locations (4 total samples) and collect only sediment samples at 2 additional locations (2 total samples). This will result in 4 total sediment samples and 2 total lakebed samples.
 - Along each cross-section line, a probe will be extended to the bottom of the impoundment to measure the top elevation of the bed. Then, the probe will be hand-pushed into the sediment until refusal to measure depth to ‘hard bottom’.
- Sampling methods and sample handling procedures:
 - Sampling will be done from a boat with a AMS multistage sampler.
 - Sampling will be completed in accordance with section 6.2 of the referenced document, *Guidance for Applying the Sediment Sampling and Analysis Requirements of Chapter NR 347, Wisconsin Administrative Code*.
- Analytical laboratory certified under NR 149, Adm. Code to conduct parameter analysis.
 - Samples will be tested at a WI DNR approved lab.
 - Pace Analytical Services, LLC in Green Bay, WI.



Sediment Sample Plan Echo Lake



Legend

- Sediment Sample Locations
- Cross Sections

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Echo Lake Sediment Sampling - Planned Samples include all highlighted fields.

Table 1. Sediment Sampling Parameters with Suggested Methods and Analyses

Parameter	Suggested Analytical Method (Suggested Detection Level) (mg/kg, dry weight unless noted)	Suggested Base Parameter Analyses ¹	
		Great Lakes or Urban/Industrial	Inland Waters (Rural/Forested)
Inorganics – Metals			
Arsenic	SW-846 3050B/6010B EPA 6010 or 7060 (5)	X	X
Barium	SW-846 3050B/6010B (0.2)		
Cadmium	SW-846 3050B/6010B EPA 7131 (0.6)	X	X
Chromium (total)	SW-846 3050B/6010B EPA 6010 or 7191 (0.6)	X	X
Copper	SW-846 3050B/6010B EPA 6010 or 7211 (0.5)	X	X
Cyanide	SW-846 9010B/9014 (0.4)		
Lead	SW-846 3050B/6010B EPA 6010 or 7421 (3)	X	X
Manganese	SW-846 3050B/6010B (0.1)		
Mercury	SW-846 7471A EPA 7471 (0.015)	X	X
Nickel	SW-846 3050B/6010B EPA 6010 (2)	X	X
Selenium	SW-846 3050B/6010B (8)	X	
Zinc	SW-846 3050B/6010B EPA 6010 or 7951 (2)	X	X
Inorganics – Nutrients			
Oil & Grease	SW-846 9070	X	
Total Phosphorus	EPA 365.2/365.3 or USGS I-6600-85 (9.9)	X	X
Nitrate + Nitrite	LACHAT 12-107-04-1-B (0.25)	X	X
Ammonia-Nitrogen	LACHAT 12-107-06-1-A (0.16)	X	X
Total Kjeldahl Nitrogen		X	X
Organics			
Aldrin	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		
Chlordane	SW-846 8081 EPA 8081, 354440B, 3541 (0.009)	X	
Dieldrin	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		
Endrin	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		
Heptachlor	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		
Lindane (Gamma BHC)	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		

¹ Suggested base parameter list reflects additions to NR347 Table 1, based on scientific research and experience with dredging projects.

Parameter	Suggested Analytical Method (Suggested Detection Level) (mg/kg, dry weight unless noted)	Suggested Base Parameter Analyses ¹	
		Great Lakes or Urban/Industrial	Inland Waters (Rural/Forested)
DDT	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)	X	
DDD & DDE	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)	X	
Toxaphene	SW-846 8081 (0.01)		
PCBs (Total)	SW-846 8081 EPA 8081, 3540B, 3541 (0.04)	X	X
		Tied to Fish Advisories	
2,3,7,8-dioxin, 2,3,7,8-furan and 15 2,3,7,8-substituted dioxin and furan congeners	EPA 8290 (1 – 10 pg/g)		
Total Organic Carbon	SW 846 8081 SW846-EPA 9060 (0.2%)	X	X
Polycyclic Aromatic Hydrocarbons (PAHs)	EPA 8310	X	
Naphthalene	(0.019)		
Phenanthrene	(0.017)		
Pyrene	(0.012)		
Fluorene	(0.058)		
2-Methylnaphthalene			
Acenaphthene	(0.017)		
Acenaphthylene	(0.021)		
Anthracene	(0.0071)		
Benzo (a) anthracene	(0.019)		
Benzo (a) pyrene	(0.023)		
Benzo (e) pyrene			
Benzo (b) fluoranthene	(0.032)		
Benzo (g,h,i) perylene	(0.022)		
Benzo (k) fluoranthene	(0.021)		
Chrysene	(0.0074)		
Dibenzo(a,h)anthracene	(0.008)		
Fluoranthene	(0.029)		
Indeno (1,2,3-cd) pyrene	(0.034)		
Physical Tests			
Particle Size Analysis – Sieve and Hydrometer Analysis	ASTM D-422 (%)	X	X
Moisture Content	ASTM D-2216 (%)	X	X
Atterburg Limits (Liquid Limit and Plastic Limit)	ASTM D4318 (as moisture content)		
Specific Gravity	ASTM D-854 (Ratio, unitless)		

May 14, 2021

Robert Wayne
AYRES & ASSOCIATES - EAU CLAIRE
3433 Oakwood Hills Parkway
Eau Claire, WI 54701

RE: Project: ECHO LAKE
Pace Project No.: 40226039

Dear Robert Wayne:

Enclosed are the analytical results for sample(s) received by the laboratory on April 30, 2021. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: ECHO LAKE
Pace Project No.: 40226039

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150

Virginia VELAP ID: 460263
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-16-00157
Federal Fish & Wildlife Permit #: LE51774A-0

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: ECHO LAKE
 Pace Project No.: 40226039

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40226039001	S1	Solid	04/29/21 13:00	04/30/21 07:30
40226039002	S2	Solid	04/29/21 13:00	04/30/21 07:30
40226039003	S3	Solid	04/29/21 13:00	04/30/21 07:30
40226039004	S4	Solid	04/29/21 13:00	04/30/21 07:30
40226039005	S5	Solid	04/29/21 13:00	04/30/21 07:30
40226039006	S6	Solid	04/29/21 13:00	04/30/21 07:30

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: ECHO LAKE
Pace Project No.: 40226039

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40226039001	S1	EPA 8082	BLM	10	PASI-G
		EPA 6020	KXS	10	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270E by SIM	JJB	20	PASI-G
		ASTM D2974-87	AH	1	PASI-G
		EPA 350.1	TMK	1	PASI-G
		EPA 351.2	TMK	1	PASI-G
		EPA 353.2	DAW	1	PASI-G
		EPA 365.4	DAW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
40226039002	S2	EPA 8082	BLM	10	PASI-G
		EPA 6020	KXS	10	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270E by SIM	JJB	20	PASI-G
		ASTM D2974-87	AH	1	PASI-G
		EPA 350.1	TMK	1	PASI-G
		EPA 351.2	TMK	1	PASI-G
		EPA 353.2	DAW	1	PASI-G
		EPA 365.4	DAW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
40226039003	S3	ASTM D2974-87	AH	1	PASI-G
		EPA 365.4	DAW	1	PASI-G
40226039004	S4	EPA 8082	BLM	10	PASI-G
		EPA 6020	KXS	10	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270E by SIM	JJB	20	PASI-G
		ASTM D2974-87	AH	1	PASI-G
		EPA 350.1	TMK	1	PASI-G
		EPA 351.2	TMK	1	PASI-G
		EPA 353.2	DAW	1	PASI-G
		EPA 365.4	DAW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
40226039005	S5	EPA 8082	BLM	10	PASI-G
		EPA 6020	KXS	10	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270E by SIM	JJB	20	PASI-G
		ASTM D2974-87	AH	1	PASI-G

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: ECHO LAKE
Pace Project No.: 40226039

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40226039006	S6	EPA 350.1	TMK	1	PASI-G
		EPA 351.2	TMK	1	PASI-G
		EPA 353.2	DAW	1	PASI-G
		EPA 365.4	DAW	1	PASI-G
		EPA 9060	TJJ	6	PASI-G
		ASTM D2974-87	AH	1	PASI-G
		EPA 365.4	DAW	1	PASI-G

PASI-G = Pace Analytical Services - Green Bay

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S1 Lab ID: 40226039001 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541 Pace Analytical Services - Green Bay								
PCB-1016 (Aroclor 1016)	<31.9	ug/kg	105	31.9	1	05/03/21 06:45	05/04/21 04:14	12674-11-2	
PCB-1221 (Aroclor 1221)	<31.9	ug/kg	105	31.9	1	05/03/21 06:45	05/04/21 04:14	11104-28-2	
PCB-1232 (Aroclor 1232)	<31.9	ug/kg	105	31.9	1	05/03/21 06:45	05/04/21 04:14	11141-16-5	
PCB-1242 (Aroclor 1242)	<31.9	ug/kg	105	31.9	1	05/03/21 06:45	05/04/21 04:14	53469-21-9	
PCB-1248 (Aroclor 1248)	<31.9	ug/kg	105	31.9	1	05/03/21 06:45	05/04/21 04:14	12672-29-6	
PCB-1254 (Aroclor 1254)	<31.9	ug/kg	105	31.9	1	05/03/21 06:45	05/04/21 04:14	11097-69-1	
PCB-1260 (Aroclor 1260)	<31.9	ug/kg	105	31.9	1	05/03/21 06:45	05/04/21 04:14	11096-82-5	
PCB, Total	<31.9	ug/kg	105	31.9	1	05/03/21 06:45	05/04/21 04:14	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	83	%	67-102		1	05/03/21 06:45	05/04/21 04:14	877-09-8	
Decachlorobiphenyl (S)	84	%	47-114		1	05/03/21 06:45	05/04/21 04:14	2051-24-3	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050 Pace Analytical Services - Green Bay								
Arsenic	6.5	mg/kg	1.8	0.55	6.667	05/05/21 06:46	05/07/21 11:38	7440-38-2	
Barium	134	mg/kg	1.8	0.55	6.667	05/05/21 06:46	05/07/21 11:38	7440-39-3	
Cadmium	1.2J	mg/kg	1.4	0.20	6.667	05/05/21 06:46	05/07/21 11:38	7440-43-9	D3
Chromium	24.8	mg/kg	4.2	1.3	6.667	05/05/21 06:46	05/07/21 11:38	7440-47-3	
Copper	15.8	mg/kg	3.7	1.1	6.667	05/05/21 06:46	05/07/21 11:38	7440-50-8	
Lead	18.7	mg/kg	1.4	0.38	6.667	05/05/21 06:46	05/07/21 11:38	7439-92-1	
Manganese	744	mg/kg	11.5	3.5	20	05/05/21 06:46	05/11/21 09:10	7439-96-5	
Nickel	16.9	mg/kg	1.8	0.55	6.667	05/05/21 06:46	05/07/21 11:38	7440-02-0	
Selenium	3.7	mg/kg	1.4	0.38	6.667	05/05/21 06:46	05/07/21 11:38	7782-49-2	
Zinc	74.7	mg/kg	48.7	14.6	6.667	05/05/21 06:46	05/07/21 11:38	7440-66-6	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471 Pace Analytical Services - Green Bay								
Mercury	0.17	mg/kg	0.066	0.019	1	05/10/21 09:19	05/11/21 13:25	7439-97-6	
8270E MSSV PAH by SIM	Analytical Method: EPA 8270E by SIM Preparation Method: EPA 3546 Pace Analytical Services - Green Bay								
Acenaphthene	<4.5	ug/kg	35.0	4.5	1	05/11/21 07:58	05/12/21 08:07	83-32-9	
Acenaphthylene	<4.4	ug/kg	35.0	4.4	1	05/11/21 07:58	05/12/21 08:07	208-96-8	
Anthracene	<4.3	ug/kg	35.0	4.3	1	05/11/21 07:58	05/12/21 08:07	120-12-7	
Benzo(a)anthracene	<4.5	ug/kg	35.0	4.5	1	05/11/21 07:58	05/12/21 08:07	56-55-3	
Benzo(a)pyrene	<4.0	ug/kg	35.0	4.0	1	05/11/21 07:58	05/12/21 08:07	50-32-8	
Benzo(b)fluoranthene	<4.9	ug/kg	35.0	4.9	1	05/11/21 07:58	05/12/21 08:07	205-99-2	
Benzo(e)pyrene	<4.1	ug/kg	35.0	4.1	1	05/11/21 07:58	05/12/21 08:07	192-97-2	
Benzo(g,h,i)perylene	<6.1	ug/kg	35.0	6.1	1	05/11/21 07:58	05/12/21 08:07	191-24-2	
Benzo(k)fluoranthene	<4.5	ug/kg	35.0	4.5	1	05/11/21 07:58	05/12/21 08:07	207-08-9	
Chrysene	<6.6	ug/kg	35.0	6.6	1	05/11/21 07:58	05/12/21 08:07	218-01-9	
Dibenz(a,h)anthracene	<4.8	ug/kg	35.0	4.8	1	05/11/21 07:58	05/12/21 08:07	53-70-3	
Fluoranthene	<4.1	ug/kg	35.0	4.1	1	05/11/21 07:58	05/12/21 08:07	206-44-0	
Fluorene	<4.2	ug/kg	35.0	4.2	1	05/11/21 07:58	05/12/21 08:07	86-73-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S1 Lab ID: 40226039001 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8270E MSSV PAH by SIM	Analytical Method: EPA 8270E by SIM Preparation Method: EPA 3546 Pace Analytical Services - Green Bay								
Indeno(1,2,3-cd)pyrene	<7.3	ug/kg	35.0	7.3	1	05/11/21 07:58	05/12/21 08:07	193-39-5	
1-Methylnaphthalene	<5.1	ug/kg	35.0	5.1	1	05/11/21 07:58	05/12/21 08:07	90-12-0	
Naphthalene	<3.4	ug/kg	35.0	3.4	1	05/11/21 07:58	05/12/21 08:07	91-20-3	
Phenanthrene	<4.0	ug/kg	35.0	4.0	1	05/11/21 07:58	05/12/21 08:07	85-01-8	
Pyrene	<5.1	ug/kg	35.0	5.1	1	05/11/21 07:58	05/12/21 08:07	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	52	%	36-86		1	05/11/21 07:58	05/12/21 08:07	321-60-8	
Terphenyl-d14 (S)	64	%	41-97		1	05/11/21 07:58	05/12/21 08:07	1718-51-0	
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Green Bay								
Percent Moisture	52.2	%	0.10	0.10	1			04/30/21 11:44	
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Green Bay								
Nitrogen, Ammonia	293	mg/kg	43.8	13.1	1	05/06/21 17:20	05/06/21 18:56	7664-41-7	
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Green Bay								
Nitrogen, Kjeldahl, Total	4380	mg/kg	371	78.6	2	05/04/21 14:20	05/05/21 15:05	7727-37-9	P6
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Green Bay								
Nitrogen, NO2 plus NO3	<2.0	mg/kg	6.6	2.0	1	05/10/21 12:00	05/11/21 14:26		
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Green Bay								
Phosphorus	965	mg/kg	41.7	6.1	1	05/03/21 10:25	05/03/21 16:05	7723-14-0	
Total Organic Carbon Quad	Analytical Method: EPA 9060 Pace Analytical Services - Green Bay								
Total Organic Carbon	48000	mg/kg	8210	2460	1			05/14/21 03:42	7440-44-0
Total Organic Carbon	46900	mg/kg	8000	2400	1			05/14/21 03:47	7440-44-0
Total Organic Carbon	45700	mg/kg	8390	2520	1			05/14/21 03:52	7440-44-0
Total Organic Carbon	47100	mg/kg	8460	2540	1			05/14/21 03:58	7440-44-0
Mean Total Organic Carbon	46900	mg/kg	8270	2480	1			05/14/21 03:42	7440-44-0
Surrogates									
RSD%	2.0	%			1			05/14/21 03:42	

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S2 Lab ID: 40226039002 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541 Pace Analytical Services - Green Bay								
PCB-1016 (Aroclor 1016)	<40.0	ug/kg	131	40.0	1	05/03/21 06:45	05/04/21 04:38	12674-11-2	
PCB-1221 (Aroclor 1221)	<40.0	ug/kg	131	40.0	1	05/03/21 06:45	05/04/21 04:38	11104-28-2	
PCB-1232 (Aroclor 1232)	<40.0	ug/kg	131	40.0	1	05/03/21 06:45	05/04/21 04:38	11141-16-5	
PCB-1242 (Aroclor 1242)	<40.0	ug/kg	131	40.0	1	05/03/21 06:45	05/04/21 04:38	53469-21-9	
PCB-1248 (Aroclor 1248)	<40.0	ug/kg	131	40.0	1	05/03/21 06:45	05/04/21 04:38	12672-29-6	
PCB-1254 (Aroclor 1254)	<40.0	ug/kg	131	40.0	1	05/03/21 06:45	05/04/21 04:38	11097-69-1	
PCB-1260 (Aroclor 1260)	<40.0	ug/kg	131	40.0	1	05/03/21 06:45	05/04/21 04:38	11096-82-5	
PCB, Total	<40.0	ug/kg	131	40.0	1	05/03/21 06:45	05/04/21 04:38	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	84	%	67-102		1	05/03/21 06:45	05/04/21 04:38	877-09-8	
Decachlorobiphenyl (S)	86	%	47-114		1	05/03/21 06:45	05/04/21 04:38	2051-24-3	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050 Pace Analytical Services - Green Bay								
Arsenic	7.0	mg/kg	2.3	0.68	6.667	05/05/21 06:46	05/07/21 12:21	7440-38-2	
Barium	97.0	mg/kg	2.2	0.67	6.667	05/05/21 06:46	05/07/21 12:21	7440-39-3	
Cadmium	1.3J	mg/kg	1.7	0.25	6.667	05/05/21 06:46	05/07/21 12:21	7440-43-9	D3
Chromium	51.1	mg/kg	5.2	1.6	6.667	05/05/21 06:46	05/07/21 12:21	7440-47-3	
Copper	15.1	mg/kg	4.6	1.4	6.667	05/05/21 06:46	05/07/21 12:21	7440-50-8	
Lead	18.1	mg/kg	1.7	0.46	6.667	05/05/21 06:46	05/07/21 12:21	7439-92-1	
Manganese	477	mg/kg	4.7	1.4	6.667	05/05/21 06:46	05/07/21 12:21	7439-96-5	
Nickel	56.6	mg/kg	2.3	0.67	6.667	05/05/21 06:46	05/07/21 12:21	7440-02-0	
Selenium	3.1	mg/kg	1.7	0.47	6.667	05/05/21 06:46	05/07/21 12:21	7782-49-2	
Zinc	63.5	mg/kg	59.5	17.8	6.667	05/05/21 06:46	05/07/21 12:21	7440-66-6	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471 Pace Analytical Services - Green Bay								
Mercury	0.18	mg/kg	0.088	0.025	1	05/10/21 09:19	05/11/21 13:28	7439-97-6	
8270E MSSV PAH by SIM	Analytical Method: EPA 8270E by SIM Preparation Method: EPA 3546 Pace Analytical Services - Green Bay								
Acenaphthene	<5.7	ug/kg	43.8	5.7	1	05/11/21 07:58	05/12/21 08:24	83-32-9	
Acenaphthylene	<5.5	ug/kg	43.8	5.5	1	05/11/21 07:58	05/12/21 08:24	208-96-8	
Anthracene	5.4J	ug/kg	43.8	5.4	1	05/11/21 07:58	05/12/21 08:24	120-12-7	
Benzo(a)anthracene	24.1J	ug/kg	43.8	5.7	1	05/11/21 07:58	05/12/21 08:24	56-55-3	
Benzo(a)pyrene	20.2J	ug/kg	43.8	5.0	1	05/11/21 07:58	05/12/21 08:24	50-32-8	
Benzo(b)fluoranthene	25.0J	ug/kg	43.8	6.1	1	05/11/21 07:58	05/12/21 08:24	205-99-2	
Benzo(e)pyrene	14.3J	ug/kg	43.8	5.1	1	05/11/21 07:58	05/12/21 08:24	192-97-2	
Benzo(g,h,i)perylene	12.9J	ug/kg	43.8	7.7	1	05/11/21 07:58	05/12/21 08:24	191-24-2	
Benzo(k)fluoranthene	13.7J	ug/kg	43.8	5.6	1	05/11/21 07:58	05/12/21 08:24	207-08-9	
Chrysene	24.8J	ug/kg	43.8	8.3	1	05/11/21 07:58	05/12/21 08:24	218-01-9	
Dibenz(a,h)anthracene	<6.1	ug/kg	43.8	6.1	1	05/11/21 07:58	05/12/21 08:24	53-70-3	
Fluoranthene	54.8	ug/kg	43.8	5.2	1	05/11/21 07:58	05/12/21 08:24	206-44-0	
Fluorene	<5.2	ug/kg	43.8	5.2	1	05/11/21 07:58	05/12/21 08:24	86-73-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S2 Lab ID: 40226039002 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8270E MSSV PAH by SIM	Analytical Method: EPA 8270E by SIM Preparation Method: EPA 3546 Pace Analytical Services - Green Bay								
Indeno(1,2,3-cd)pyrene	11.5J	ug/kg	43.8	9.1	1	05/11/21 07:58	05/12/21 08:24	193-39-5	
1-Methylnaphthalene	<6.4	ug/kg	43.8	6.4	1	05/11/21 07:58	05/12/21 08:24	90-12-0	
Naphthalene	<4.3	ug/kg	43.8	4.3	1	05/11/21 07:58	05/12/21 08:24	91-20-3	
Phenanthrene	32.8J	ug/kg	43.8	5.0	1	05/11/21 07:58	05/12/21 08:24	85-01-8	
Pyrene	45.0	ug/kg	43.8	6.4	1	05/11/21 07:58	05/12/21 08:24	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	58	%	36-86		1	05/11/21 07:58	05/12/21 08:24	321-60-8	
Terphenyl-d14 (S)	65	%	41-97		1	05/11/21 07:58	05/12/21 08:24	1718-51-0	
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Green Bay								
Percent Moisture	61.9	%	0.10	0.10	1			04/30/21 11:44	
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Green Bay								
Nitrogen, Ammonia	621	mg/kg	53.3	16.0	1	05/06/21 17:20	05/06/21 18:56	7664-41-7	
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Green Bay								
Nitrogen, Kjeldahl, Total	5090	mg/kg	473	100	2	05/04/21 14:20	05/05/21 15:07	7727-37-9	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Green Bay								
Nitrogen, NO2 plus NO3	<2.5	mg/kg	8.3	2.5	1	05/10/21 12:00	05/11/21 14:27		
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Green Bay								
Phosphorus	1330	mg/kg	47.9	7.0	1	05/03/21 10:25	05/03/21 16:06	7723-14-0	
Total Organic Carbon Quad	Analytical Method: EPA 9060 Pace Analytical Services - Green Bay								
Total Organic Carbon	61800	mg/kg	8870	2660	1			05/14/21 04:49	7440-44-0
Total Organic Carbon	60400	mg/kg	8880	2660	1			05/14/21 04:55	7440-44-0
Total Organic Carbon	64500	mg/kg	8520	2560	1			05/14/21 05:00	7440-44-0
Total Organic Carbon	78200	mg/kg	8840	2650	1			05/14/21 05:06	7440-44-0
Mean Total Organic Carbon	66200	mg/kg	8780	2630	1			05/14/21 04:49	7440-44-0
Surrogates									
RSD%	12.3	%			1			05/14/21 04:49	

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S3 Lab ID: 40226039003 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Green Bay								
Percent Moisture	71.0	%	0.10	0.10	1			04/30/21 11:44	
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Green Bay								
Phosphorus	1710	mg/kg	60.5	8.9	1	05/03/21 10:25	05/03/21 16:07	7723-14-0	

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S4 Lab ID: 40226039004 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541 Pace Analytical Services - Green Bay								
PCB-1016 (Aroclor 1016)	<30.4	ug/kg	100	30.4	1	05/03/21 06:45	05/04/21 05:51	12674-11-2	
PCB-1221 (Aroclor 1221)	<30.4	ug/kg	100	30.4	1	05/03/21 06:45	05/04/21 05:51	11104-28-2	
PCB-1232 (Aroclor 1232)	<30.4	ug/kg	100	30.4	1	05/03/21 06:45	05/04/21 05:51	11141-16-5	
PCB-1242 (Aroclor 1242)	<30.4	ug/kg	100	30.4	1	05/03/21 06:45	05/04/21 05:51	53469-21-9	
PCB-1248 (Aroclor 1248)	<30.4	ug/kg	100	30.4	1	05/03/21 06:45	05/04/21 05:51	12672-29-6	
PCB-1254 (Aroclor 1254)	<30.4	ug/kg	100	30.4	1	05/03/21 06:45	05/04/21 05:51	11097-69-1	
PCB-1260 (Aroclor 1260)	<30.4	ug/kg	100	30.4	1	05/03/21 06:45	05/04/21 05:51	11096-82-5	
PCB, Total	<30.4	ug/kg	100	30.4	1	05/03/21 06:45	05/04/21 05:51	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	85	%	67-102		1	05/03/21 06:45	05/04/21 05:51	877-09-8	
Decachlorobiphenyl (S)	90	%	47-114		1	05/03/21 06:45	05/04/21 05:51	2051-24-3	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050 Pace Analytical Services - Green Bay								
Arsenic	5.5	mg/kg	1.6	0.49	6.667	05/05/21 06:46	05/07/21 12:35	7440-38-2	
Barium	134	mg/kg	1.6	0.49	6.667	05/05/21 06:46	05/07/21 12:35	7440-39-3	
Cadmium	0.58J	mg/kg	1.2	0.18	6.667	05/05/21 06:46	05/07/21 12:35	7440-43-9	D3
Chromium	23.7	mg/kg	3.7	1.1	6.667	05/05/21 06:46	05/07/21 12:35	7440-47-3	
Copper	16.5	mg/kg	3.3	0.99	6.667	05/05/21 06:46	05/07/21 12:35	7440-50-8	
Lead	24.3	mg/kg	1.2	0.34	6.667	05/05/21 06:46	05/07/21 12:35	7439-92-1	
Manganese	654	mg/kg	3.4	1.0	6.667	05/05/21 06:46	05/07/21 12:35	7439-96-5	
Nickel	16.6	mg/kg	1.6	0.49	6.667	05/05/21 06:46	05/07/21 12:35	7440-02-0	
Selenium	2.9	mg/kg	1.2	0.34	6.667	05/05/21 06:46	05/07/21 12:35	7782-49-2	
Zinc	79.6	mg/kg	43.0	12.9	6.667	05/05/21 06:46	05/07/21 12:35	7440-66-6	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471 Pace Analytical Services - Green Bay								
Mercury	0.21	mg/kg	0.069	0.020	1	05/10/21 09:19	05/11/21 13:30	7439-97-6	
8270E MSSV PAH by SIM	Analytical Method: EPA 8270E by SIM Preparation Method: EPA 3546 Pace Analytical Services - Green Bay								
Acenaphthene	<4.3	ug/kg	33.4	4.3	1	05/11/21 07:58	05/12/21 22:12	83-32-9	
Acenaphthylene	5.5J	ug/kg	33.4	4.2	1	05/11/21 07:58	05/12/21 22:12	208-96-8	
Anthracene	5.6J	ug/kg	33.4	4.1	1	05/11/21 07:58	05/12/21 22:12	120-12-7	
Benzo(a)anthracene	9.8J	ug/kg	33.4	4.3	1	05/11/21 07:58	05/12/21 22:12	56-55-3	
Benzo(a)pyrene	5.5J	ug/kg	33.4	3.8	1	05/11/21 07:58	05/12/21 22:12	50-32-8	
Benzo(b)fluoranthene	10.3J	ug/kg	33.4	4.6	1	05/11/21 07:58	05/12/21 22:12	205-99-2	
Benzo(e)pyrene	5.5J	ug/kg	33.4	3.9	1	05/11/21 07:58	05/12/21 22:12	192-97-2	
Benzo(g,h,i)perylene	<5.9	ug/kg	33.4	5.9	1	05/11/21 07:58	05/12/21 22:12	191-24-2	
Benzo(k)fluoranthene	4.5J	ug/kg	33.4	4.3	1	05/11/21 07:58	05/12/21 22:12	207-08-9	
Chrysene	9.5J	ug/kg	33.4	6.3	1	05/11/21 07:58	05/12/21 22:12	218-01-9	
Dibenz(a,h)anthracene	<4.6	ug/kg	33.4	4.6	1	05/11/21 07:58	05/12/21 22:12	53-70-3	
Fluoranthene	28.2J	ug/kg	33.4	4.0	1	05/11/21 07:58	05/12/21 22:12	206-44-0	
Fluorene	9.4J	ug/kg	33.4	4.0	1	05/11/21 07:58	05/12/21 22:12	86-73-7	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S4 Lab ID: 40226039004 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8270E MSSV PAH by SIM	Analytical Method: EPA 8270E by SIM Preparation Method: EPA 3546 Pace Analytical Services - Green Bay								
Indeno(1,2,3-cd)pyrene	<7.0	ug/kg	33.4	7.0	1	05/11/21 07:58	05/12/21 22:12	193-39-5	
1-Methylnaphthalene	24.3J	ug/kg	33.4	4.9	1	05/11/21 07:58	05/12/21 22:12	90-12-0	
Naphthalene	23.2J	ug/kg	33.4	3.3	1	05/11/21 07:58	05/12/21 22:12	91-20-3	
Phenanthrene	24.2J	ug/kg	33.4	3.8	1	05/11/21 07:58	05/12/21 22:12	85-01-8	
Pyrene	22.3J	ug/kg	33.4	4.9	1	05/11/21 07:58	05/12/21 22:12	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	54	%	36-86		1	05/11/21 07:58	05/12/21 22:12	321-60-8	
Terphenyl-d14 (S)	52	%	41-97		1	05/11/21 07:58	05/12/21 22:12	1718-51-0	
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Green Bay								
Percent Moisture	50.0	%	0.10	0.10	1		04/30/21 11:44		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Green Bay								
Nitrogen, Ammonia	468	mg/kg	41.9	12.6	1	05/06/21 17:20	05/06/21 18:57	7664-41-7	
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Green Bay								
Nitrogen, Kjeldahl, Total	4360	mg/kg	352	74.7	2	05/04/21 14:20	05/05/21 15:08	7727-37-9	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Green Bay								
Nitrogen, NO2 plus NO3	<1.9	mg/kg	6.2	1.9	1	05/10/21 12:00	05/11/21 14:28		
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Green Bay								
Phosphorus	738	mg/kg	28.7	4.2	1	05/03/21 10:25	05/03/21 16:09	7723-14-0	
Total Organic Carbon Quad	Analytical Method: EPA 9060 Pace Analytical Services - Green Bay								
Total Organic Carbon	52000	mg/kg	6480	1940	1		05/14/21 05:12	7440-44-0	
Total Organic Carbon	49900	mg/kg	6490	1950	1		05/14/21 05:18	7440-44-0	
Total Organic Carbon	52400	mg/kg	6580	1970	1		05/14/21 05:23	7440-44-0	
Total Organic Carbon	55300	mg/kg	6760	2030	1		05/14/21 05:29	7440-44-0	
Mean Total Organic Carbon	52400	mg/kg	6570	1970	1		05/14/21 05:12	7440-44-0	
Surrogates									
RSD%	4.2	%			1		05/14/21 05:12		

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S5 Lab ID: 40226039005 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541 Pace Analytical Services - Green Bay								
PCB-1016 (Aroclor 1016)	<30.9	ug/kg	102	30.9	1	05/03/21 06:45	05/04/21 06:15	12674-11-2	
PCB-1221 (Aroclor 1221)	<30.9	ug/kg	102	30.9	1	05/03/21 06:45	05/04/21 06:15	11104-28-2	
PCB-1232 (Aroclor 1232)	<30.9	ug/kg	102	30.9	1	05/03/21 06:45	05/04/21 06:15	11141-16-5	
PCB-1242 (Aroclor 1242)	<30.9	ug/kg	102	30.9	1	05/03/21 06:45	05/04/21 06:15	53469-21-9	
PCB-1248 (Aroclor 1248)	<30.9	ug/kg	102	30.9	1	05/03/21 06:45	05/04/21 06:15	12672-29-6	
PCB-1254 (Aroclor 1254)	<30.9	ug/kg	102	30.9	1	05/03/21 06:45	05/04/21 06:15	11097-69-1	
PCB-1260 (Aroclor 1260)	<30.9	ug/kg	102	30.9	1	05/03/21 06:45	05/04/21 06:15	11096-82-5	
PCB, Total	<30.9	ug/kg	102	30.9	1	05/03/21 06:45	05/04/21 06:15	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	83	%	67-102		1	05/03/21 06:45	05/04/21 06:15	877-09-8	
Decachlorobiphenyl (S)	78	%	47-114		1	05/03/21 06:45	05/04/21 06:15	2051-24-3	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050 Pace Analytical Services - Green Bay								
Arsenic	8.0	mg/kg	1.7	0.52	6.667	05/05/21 06:46	05/07/21 12:42	7440-38-2	
Barium	109	mg/kg	1.7	0.52	6.667	05/05/21 06:46	05/07/21 12:42	7440-39-3	
Cadmium	0.48J	mg/kg	1.3	0.19	6.667	05/05/21 06:46	05/07/21 12:42	7440-43-9	D3
Chromium	26.9	mg/kg	4.0	1.2	6.667	05/05/21 06:46	05/07/21 12:42	7440-47-3	
Copper	16.1	mg/kg	3.5	1.1	6.667	05/05/21 06:46	05/07/21 12:42	7440-50-8	
Lead	26.9	mg/kg	1.3	0.36	6.667	05/05/21 06:46	05/07/21 12:42	7439-92-1	
Manganese	473	mg/kg	3.6	1.1	6.667	05/05/21 06:46	05/07/21 12:42	7439-96-5	
Nickel	27.5	mg/kg	1.7	0.52	6.667	05/05/21 06:46	05/07/21 12:42	7440-02-0	
Selenium	2.7	mg/kg	1.3	0.36	6.667	05/05/21 06:46	05/07/21 12:42	7782-49-2	
Zinc	76.0	mg/kg	46.0	13.8	6.667	05/05/21 06:46	05/07/21 12:42	7440-66-6	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471 Pace Analytical Services - Green Bay								
Mercury	0.19	mg/kg	0.071	0.020	1	05/10/21 09:19	05/11/21 13:32	7439-97-6	
8270E MSSV PAH by SIM	Analytical Method: EPA 8270E by SIM Preparation Method: EPA 3546 Pace Analytical Services - Green Bay								
Acenaphthene	<4.4	ug/kg	33.9	4.4	1	05/11/21 07:58	05/12/21 22:29	83-32-9	
Acenaphthylene	<4.3	ug/kg	33.9	4.3	1	05/11/21 07:58	05/12/21 22:29	208-96-8	
Anthracene	5.6J	ug/kg	33.9	4.2	1	05/11/21 07:58	05/12/21 22:29	120-12-7	
Benzo(a)anthracene	35.0	ug/kg	33.9	4.4	1	05/11/21 07:58	05/12/21 22:29	56-55-3	
Benzo(a)pyrene	35.6	ug/kg	33.9	3.9	1	05/11/21 07:58	05/12/21 22:29	50-32-8	
Benzo(b)fluoranthene	51.1	ug/kg	33.9	4.7	1	05/11/21 07:58	05/12/21 22:29	205-99-2	
Benzo(e)pyrene	25.8J	ug/kg	33.9	4.0	1	05/11/21 07:58	05/12/21 22:29	192-97-2	
Benzo(g,h,i)perylene	23.4J	ug/kg	33.9	6.0	1	05/11/21 07:58	05/12/21 22:29	191-24-2	
Benzo(k)fluoranthene	18.2J	ug/kg	33.9	4.3	1	05/11/21 07:58	05/12/21 22:29	207-08-9	
Chrysene	40.2	ug/kg	33.9	6.4	1	05/11/21 07:58	05/12/21 22:29	218-01-9	
Dibenz(a,h)anthracene	7.4J	ug/kg	33.9	4.7	1	05/11/21 07:58	05/12/21 22:29	53-70-3	
Fluoranthene	85.9	ug/kg	33.9	4.0	1	05/11/21 07:58	05/12/21 22:29	206-44-0	
Fluorene	<4.1	ug/kg	33.9	4.1	1	05/11/21 07:58	05/12/21 22:29	86-73-7	

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S5 Lab ID: 40226039005 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8270E MSSV PAH by SIM	Analytical Method: EPA 8270E by SIM Preparation Method: EPA 3546 Pace Analytical Services - Green Bay								
Indeno(1,2,3-cd)pyrene	22.0J	ug/kg	33.9	7.1	1	05/11/21 07:58	05/12/21 22:29	193-39-5	
1-Methylnaphthalene	<5.0	ug/kg	33.9	5.0	1	05/11/21 07:58	05/12/21 22:29	90-12-0	
Naphthalene	<3.3	ug/kg	33.9	3.3	1	05/11/21 07:58	05/12/21 22:29	91-20-3	
Phenanthrene	38.6	ug/kg	33.9	3.9	1	05/11/21 07:58	05/12/21 22:29	85-01-8	
Pyrene	69.7	ug/kg	33.9	5.0	1	05/11/21 07:58	05/12/21 22:29	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	64	%	36-86		1	05/11/21 07:58	05/12/21 22:29	321-60-8	
Terphenyl-d14 (S)	71	%	41-97		1	05/11/21 07:58	05/12/21 22:29	1718-51-0	
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Green Bay								
Percent Moisture	50.8	%	0.10	0.10	1			04/30/21 11:44	
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Green Bay								
Nitrogen, Ammonia	264	mg/kg	38.7	11.6	1	05/06/21 17:20	05/06/21 19:00	7664-41-7	
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Green Bay								
Nitrogen, Kjeldahl, Total	4000	mg/kg	389	82.4	2	05/04/21 14:20	05/05/21 15:11	7727-37-9	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Green Bay								
Nitrogen, NO2 plus NO3	<1.9	mg/kg	6.4	1.9	1	05/10/21 12:00	05/11/21 14:28		
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Green Bay								
Phosphorus	803	mg/kg	31.5	4.6	1	05/03/21 10:25	05/03/21 16:10	7723-14-0	
Total Organic Carbon Quad	Analytical Method: EPA 9060 Pace Analytical Services - Green Bay								
Total Organic Carbon	45800	mg/kg	6880	2060	1			05/14/21 05:35	7440-44-0
Total Organic Carbon	45800	mg/kg	6600	1980	1			05/14/21 05:40	7440-44-0
Total Organic Carbon	47400	mg/kg	6680	2000	1			05/14/21 05:46	7440-44-0
Total Organic Carbon	46300	mg/kg	6860	2060	1			05/14/21 05:51	7440-44-0
Mean Total Organic Carbon	46300	mg/kg	6760	2030	1			05/14/21 05:35	7440-44-0
Surrogates									
RSD%	1.6	%			1			05/14/21 05:35	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: ECHO LAKE
Pace Project No.: 40226039

Sample: S6 Lab ID: 40226039006 Collected: 04/29/21 13:00 Received: 04/30/21 07:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Green Bay								
Percent Moisture	43.8	%	0.10	0.10	1			04/30/21 11:44	
365.4 Total Phosphorus	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Green Bay								
Phosphorus	873	mg/kg	35.1	5.2	1	05/03/21 10:25	05/03/21 16:11	7723-14-0	

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	384605	Analysis Method:	EPA 7471
QC Batch Method:	EPA 7471	Analysis Description:	7471 Mercury
		Laboratory:	Pace Analytical Services - Green Bay

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

METHOD BLANK: 2218652 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	0.010J	0.035	05/11/21 12:27	

LABORATORY CONTROL SAMPLE: 2218653

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	0.83	0.81	97	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2218654 2218655

Parameter	Units	MS Result	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	0.013J	0.84	0.85	0.81	0.83	96	97	85-115	2	20

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	384293	Analysis Method:	EPA 6020
QC Batch Method:	EPA 3050	Analysis Description:	6020 MET
		Laboratory:	Pace Analytical Services - Green Bay
Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005			

METHOD BLANK: 2216879 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	<0.040	0.13	05/07/21 11:23	
Barium	mg/kg	<0.039	0.13	05/07/21 11:23	
Cadmium	mg/kg	<0.015	0.10	05/07/21 11:23	
Chromium	mg/kg	<0.091	0.30	05/07/21 11:23	
Copper	mg/kg	<0.080	0.27	05/07/21 11:23	
Lead	mg/kg	<0.027	0.10	05/07/21 11:23	
Manganese	mg/kg	<0.083	0.28	05/07/21 11:23	
Nickel	mg/kg	<0.040	0.13	05/07/21 11:23	
Selenium	mg/kg	<0.027	0.10	05/07/21 11:23	
Zinc	mg/kg	<1.0	3.5	05/07/21 11:23	

LABORATORY CONTROL SAMPLE: 2216880

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	50	48.9	98	80-120	
Barium	mg/kg	50	48.8	98	80-120	
Cadmium	mg/kg	50	50.9	102	80-120	
Chromium	mg/kg	50	47.9	96	80-120	
Copper	mg/kg	50	49.5	99	80-120	
Lead	mg/kg	50	48.0	96	80-120	
Manganese	mg/kg	50	47.0	94	80-120	
Nickel	mg/kg	50	48.5	97	80-120	
Selenium	mg/kg	50	50.2	100	80-120	
Zinc	mg/kg	50	50.2	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2216881 2216882

Parameter	Units	40226039001	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		Result										
Arsenic	mg/kg	6.5	104	104	106	106	96	96	75-125	1	20	
Barium	mg/kg	134	104	104	246	262	107	123	75-125	6	20	
Cadmium	mg/kg	1.2J	104	104	102	102	96	97	75-125	0	20	
Chromium	mg/kg	24.8	104	104	123	126	94	97	75-125	2	20	
Copper	mg/kg	15.8	104	104	111	114	91	94	75-125	2	20	
Lead	mg/kg	18.7	104	104	122	123	99	100	75-125	1	20	
Manganese	mg/kg	744	104	104	842	828	93	80	75-125	2	20	
Nickel	mg/kg	16.9	104	104	114	114	93	94	75-125	0	20	

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

MATRIX SPIKE & MATRIX SPIKE DUPLICATE:		2216881		2216882									
Parameter	Units	MS		MSD		MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		40226039001	Spike Conc.	Spike Conc.	MS Result								
Selenium	mg/kg	3.7	104	104	105	104	97	96	75-125	1	20		
Zinc	mg/kg	74.7	104	104	170	180	92	102	75-125	6	20		

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	384033	Analysis Method:	EPA 8082
QC Batch Method:	EPA 3541	Analysis Description:	8082 GCS PCB
		Laboratory:	Pace Analytical Services - Green Bay
Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005			

METHOD BLANK: 2215697 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	<15.2	50.0	05/03/21 23:22	
PCB-1221 (Aroclor 1221)	ug/kg	<15.2	50.0	05/03/21 23:22	
PCB-1232 (Aroclor 1232)	ug/kg	<15.2	50.0	05/03/21 23:22	
PCB-1242 (Aroclor 1242)	ug/kg	<15.2	50.0	05/03/21 23:22	
PCB-1248 (Aroclor 1248)	ug/kg	<15.2	50.0	05/03/21 23:22	
PCB-1254 (Aroclor 1254)	ug/kg	<15.2	50.0	05/03/21 23:22	
PCB-1260 (Aroclor 1260)	ug/kg	<15.2	50.0	05/03/21 23:22	
Decachlorobiphenyl (S)	%	84	47-114	05/03/21 23:22	
Tetrachloro-m-xylene (S)	%	85	67-102	05/03/21 23:22	

LABORATORY CONTROL SAMPLE: 2215698

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg		<15.2			
PCB-1221 (Aroclor 1221)	ug/kg		<15.2			
PCB-1232 (Aroclor 1232)	ug/kg		<15.2			
PCB-1242 (Aroclor 1242)	ug/kg		<15.2			
PCB-1248 (Aroclor 1248)	ug/kg		<15.2			
PCB-1254 (Aroclor 1254)	ug/kg		<15.2			
PCB-1260 (Aroclor 1260)	ug/kg	500	441	88	69-115	
Decachlorobiphenyl (S)	%			91	47-114	
Tetrachloro-m-xylene (S)	%			87	67-102	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2215699 2215700

Parameter	Units	MS		MSD		MS Result	MS % Rec	MSD Result	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		40225865001	Spike Conc.	Spike Conc.	Result								
PCB-1016 (Aroclor 1016)	ug/kg	<106				<106		<106				20	
PCB-1221 (Aroclor 1221)	ug/kg	<106				<106		<106				20	
PCB-1232 (Aroclor 1232)	ug/kg	<106				<106		<106				20	
PCB-1242 (Aroclor 1242)	ug/kg	<106				<106		<106				20	
PCB-1248 (Aroclor 1248)	ug/kg	<106				<106		<106				20	
PCB-1254 (Aroclor 1254)	ug/kg	<106				<106		<106				20	
PCB-1260 (Aroclor 1260)	ug/kg	<106	3480	3490	2230	2300	64		66	45-120	3	20	
Decachlorobiphenyl (S)	%						60		62	47-114			
Tetrachloro-m-xylene (S)	%						79		82	67-102			

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	384808	Analysis Method:	EPA 8270E by SIM
QC Batch Method:	EPA 3546	Analysis Description:	8270E/3546 MSSV PAH by SIM
		Laboratory:	Pace Analytical Services - Green Bay

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

METHOD BLANK: 2219991 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1-Methylnaphthalene	ug/kg	<2.4	16.7	05/11/21 11:38	
Acenaphthene	ug/kg	<2.2	16.7	05/11/21 11:38	
Acenaphthylene	ug/kg	<2.1	16.7	05/11/21 11:38	
Anthracene	ug/kg	<2.1	16.7	05/11/21 11:38	
Benzo(a)anthracene	ug/kg	<2.2	16.7	05/11/21 11:38	
Benzo(a)pyrene	ug/kg	<1.9	16.7	05/11/21 11:38	
Benzo(b)fluoranthene	ug/kg	<2.3	16.7	05/11/21 11:38	
Benzo(e)pyrene	ug/kg	<1.9	16.7	05/11/21 11:38	
Benzo(g,h,i)perylene	ug/kg	<2.9	16.7	05/11/21 11:38	
Benzo(k)fluoranthene	ug/kg	<2.1	16.7	05/11/21 11:38	
Chrysene	ug/kg	<3.1	16.7	05/11/21 11:38	
Dibenz(a,h)anthracene	ug/kg	<2.3	16.7	05/11/21 11:38	
Fluoranthene	ug/kg	<2.0	16.7	05/11/21 11:38	
Fluorene	ug/kg	<2.0	16.7	05/11/21 11:38	
Indeno(1,2,3-cd)pyrene	ug/kg	<3.5	16.7	05/11/21 11:38	
Naphthalene	ug/kg	<1.6	16.7	05/11/21 11:38	
Phenanthrene	ug/kg	<1.9	16.7	05/11/21 11:38	
Pyrene	ug/kg	<2.5	16.7	05/11/21 11:38	
2-Fluorobiphenyl (S)	%	79	36-86	05/11/21 11:38	
Terphenyl-d14 (S)	%	89	41-97	05/11/21 11:38	

LABORATORY CONTROL SAMPLE: 2219992

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1-Methylnaphthalene	ug/kg	333	246	74	53-100	
Acenaphthene	ug/kg	333	287	86	62-120	
Acenaphthylene	ug/kg	333	291	87	61-120	
Anthracene	ug/kg	333	323	97	62-111	
Benzo(a)anthracene	ug/kg	333	301	90	61-120	
Benzo(a)pyrene	ug/kg	333	333	100	65-120	
Benzo(b)fluoranthene	ug/kg	333	325	98	64-108	
Benzo(e)pyrene	ug/kg	333	330	99	56-116	
Benzo(g,h,i)perylene	ug/kg	333	333	100	71-120	
Benzo(k)fluoranthene	ug/kg	333	321	96	76-120	
Chrysene	ug/kg	333	318	96	74-120	
Dibenz(a,h)anthracene	ug/kg	333	342	103	71-120	
Fluoranthene	ug/kg	333	312	94	67-112	
Fluorene	ug/kg	333	298	89	65-120	
Indeno(1,2,3-cd)pyrene	ug/kg	333	341	102	74-120	

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

LABORATORY CONTROL SAMPLE: 2219992

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Naphthalene	ug/kg	333	264	79	53-120	
Phenanthrene	ug/kg	333	309	93	67-120	
Pyrene	ug/kg	333	313	94	60-103	
2-Fluorobiphenyl (S)	%			82	36-86	
Terphenyl-d14 (S)	%			89	41-97	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2219993 2219994

Parameter	Units	MS 40226163006		MSD Spike Conc.		MS 2219994		MSD % Rec		% Rec Limits		Max RPD	RPD Qual
		Result	Spike Conc.	Result	Spike Conc.	Result	% Rec	Result	% Rec	Limits	RPD		
1-Methylnaphthalene	ug/kg	<2.9	399	399	209	257	53	64	41-100	20	29		
Acenaphthene	ug/kg	<2.6	399	399	258	284	65	71	43-120	10	27		
Acenaphthylene	ug/kg	<2.5	399	399	263	293	66	73	51-120	11	26		
Anthracene	ug/kg	<2.5	399	399	312	316	78	79	46-111	1	29		
Benzo(a)anthracene	ug/kg	<2.6	399	399	287	285	71	71	48-120	1	23		
Benzo(a)pyrene	ug/kg	<2.3	399	399	320	315	80	79	46-108	2	30		
Benzo(b)fluoranthene	ug/kg	<2.8	399	399	296	292	74	73	45-108	1	30		
Benzo(e)pyrene	ug/kg	<2.3	399	399	316	309	79	77	21-122	2	24		
Benzo(g,h,i)perylene	ug/kg	<3.5	399	399	309	302	77	75	39-120	2	37		
Benzo(k)fluoranthene	ug/kg	<2.6	399	399	338	336	85	84	47-120	1	31		
Chrysene	ug/kg	<3.8	399	399	312	311	78	78	54-120	0	21		
Dibenz(a,h)anthracene	ug/kg	<2.8	399	399	319	313	80	79	46-120	2	34		
Fluoranthene	ug/kg	<2.4	399	399	302	302	76	76	53-112	0	27		
Fluorene	ug/kg	<2.4	399	399	279	293	70	73	48-120	5	29		
Indeno(1,2,3-cd)pyrene	ug/kg	<4.2	399	399	317	311	79	78	40-120	2	34		
Naphthalene	ug/kg	<1.9	399	399	213	281	53	70	47-120	28	25 R1		
Phenanthrene	ug/kg	<2.3	399	399	296	302	74	76	49-120	2	28		
Pyrene	ug/kg	<2.9	399	399	308	307	77	77	43-103	0	31		
2-Fluorobiphenyl (S)	%						58	66	36-86				
Terphenyl-d14 (S)	%						73	71	41-97				

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QUALITY CONTROL DATA

Project: ECHO LAKE
 Pace Project No.: 40226039

QC Batch:	383952	Analysis Method:	ASTM D2974-87
QC Batch Method:	ASTM D2974-87	Analysis Description:	Dry Weight/Percent Moisture
		Laboratory:	Pace Analytical Services - Green Bay

Associated Lab Samples: 40226039001, 40226039002, 40226039003, 40226039004, 40226039005, 40226039006

SAMPLE DUPLICATE: 2214854

Parameter	Units	40226034002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	49.5	48.1	3	10	

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	384498	Analysis Method:	EPA 350.1
QC Batch Method:	EPA 350.1	Analysis Description:	350.1 Ammonia
		Laboratory:	Pace Analytical Services - Green Bay

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

METHOD BLANK: 2217916 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	<6.4	21.5	05/06/21 18:49	

LABORATORY CONTROL SAMPLE: 2217917

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	300	293	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2217918 2217919

Parameter	Units	MS Result	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/kg	62.9	299	302	354	303	98	80	80-120	15	20

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	384222	Analysis Method:	EPA 351.2
QC Batch Method:	EPA 351.2	Analysis Description:	351.2 TKN
		Laboratory:	Pace Analytical Services - Green Bay

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

METHOD BLANK: 2216399 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	<21.2	100	05/05/21 13:27	

LABORATORY CONTROL SAMPLE: 2216400

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	500	490	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2216401 2216402

Parameter	Units	MS Result	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Max Qual
Nitrogen, Kjeldahl, Total	mg/kg	10900	2350	2350	13900	13400	586	566	80-120	4	20 P6

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2216403 2216404

Parameter	Units	MS Result	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Max Qual
Nitrogen, Kjeldahl, Total	mg/kg	4380	919	915	4970	4820	536	523	80-120	3	20 P6

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	384718	Analysis Method:	EPA 353.2
QC Batch Method:	EPA 353.2	Analysis Description:	353.2 Nitrate + Nitrite
		Laboratory:	Pace Analytical Services - Green Bay
Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005			

METHOD BLANK: 2219664 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, NO ₂ plus NO ₃	mg/kg	<0.97	3.2	05/11/21 14:21	

LABORATORY CONTROL SAMPLE: 2219665

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO ₂ plus NO ₃	mg/kg	25	24.7	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2219666 2219667

Parameter	Units	MS Result	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO ₂ plus NO ₃	mg/kg	<47.1	1210	1210	1230	1210	98	96	80-120	2	20

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	384030	Analysis Method:	EPA 365.4
QC Batch Method:	EPA 365.4	Analysis Description:	365.4 Total Phosphorus
		Laboratory:	Pace Analytical Services - Green Bay

Associated Lab Samples: 40226039001, 40226039002, 40226039003, 40226039004, 40226039005, 40226039006

METHOD BLANK: 2215684 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039003, 40226039004, 40226039005, 40226039006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/kg	3.1J	20.0	05/03/21 15:46	

LABORATORY CONTROL SAMPLE: 2215685

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/kg	500	518	104	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2215686 2215687

Parameter	Units	MS Result	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Phosphorus	mg/kg	333	493	484	692	837	73	104	80-120	19	20 M0

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2215688 2215689

Parameter	Units	MS Result	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Phosphorus	mg/kg	873	908	933	1740	1710	95	90	80-120	1	20

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QUALITY CONTROL DATA

Project: ECHO LAKE
Pace Project No.: 40226039

QC Batch:	385114	Analysis Method:	EPA 9060
QC Batch Method:	EPA 9060	Analysis Description:	9060 TOC Average
		Laboratory:	Pace Analytical Services - Green Bay

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

METHOD BLANK: 2221902 Matrix: Solid

Associated Lab Samples: 40226039001, 40226039002, 40226039004, 40226039005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mean Total Organic Carbon	mg/kg	<194	647	05/14/21 02:30	

LABORATORY CONTROL SAMPLE: 2221903

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mean Total Organic Carbon	mg/kg	120000	119000	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2221904 2221905

Parameter	Units	MS Result	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mean Total Organic Carbon	mg/kg	46900	76600	75000	111000	111000	84	85	50-150	0	30

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: ECHO LAKE
Pace Project No.: 40226039

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

D3 Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

M0 Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.

P6 Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

R1 RPD value was outside control limits.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: ECHO LAKE
Pace Project No.: 40226039

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40226039001	S1	EPA 3541	384033	EPA 8082	384034
40226039002	S2	EPA 3541	384033	EPA 8082	384034
40226039004	S4	EPA 3541	384033	EPA 8082	384034
40226039005	S5	EPA 3541	384033	EPA 8082	384034
40226039001	S1	EPA 3050	384293	EPA 6020	384367
40226039002	S2	EPA 3050	384293	EPA 6020	384367
40226039004	S4	EPA 3050	384293	EPA 6020	384367
40226039005	S5	EPA 3050	384293	EPA 6020	384367
40226039001	S1	EPA 7471	384605	EPA 7471	384731
40226039002	S2	EPA 7471	384605	EPA 7471	384731
40226039004	S4	EPA 7471	384605	EPA 7471	384731
40226039005	S5	EPA 7471	384605	EPA 7471	384731
40226039001	S1	EPA 3546	384808	EPA 8270E by SIM	384860
40226039002	S2	EPA 3546	384808	EPA 8270E by SIM	384860
40226039004	S4	EPA 3546	384808	EPA 8270E by SIM	384860
40226039005	S5	EPA 3546	384808	EPA 8270E by SIM	384860
40226039001	S1	ASTM D2974-87	383952		
40226039002	S2	ASTM D2974-87	383952		
40226039003	S3	ASTM D2974-87	383952		
40226039004	S4	ASTM D2974-87	383952		
40226039005	S5	ASTM D2974-87	383952		
40226039006	S6	ASTM D2974-87	383952		
40226039001	S1	EPA 350.1	384498	EPA 350.1	384532
40226039002	S2	EPA 350.1	384498	EPA 350.1	384532
40226039004	S4	EPA 350.1	384498	EPA 350.1	384532
40226039005	S5	EPA 350.1	384498	EPA 350.1	384532
40226039001	S1	EPA 351.2	384222	EPA 351.2	384279
40226039002	S2	EPA 351.2	384222	EPA 351.2	384279
40226039004	S4	EPA 351.2	384222	EPA 351.2	384279
40226039005	S5	EPA 351.2	384222	EPA 351.2	384279
40226039001	S1	EPA 353.2	384718	EPA 353.2	384865
40226039002	S2	EPA 353.2	384718	EPA 353.2	384865
40226039004	S4	EPA 353.2	384718	EPA 353.2	384865
40226039005	S5	EPA 353.2	384718	EPA 353.2	384865
40226039001	S1	EPA 365.4	384030	EPA 365.4	384071
40226039002	S2	EPA 365.4	384030	EPA 365.4	384071
40226039003	S3	EPA 365.4	384030	EPA 365.4	384071
40226039004	S4	EPA 365.4	384030	EPA 365.4	384071
40226039005	S5	EPA 365.4	384030	EPA 365.4	384071
40226039006	S6	EPA 365.4	384030	EPA 365.4	384071
40226039001	S1	EPA 9060	385114		
40226039001	S1	EPA 9060	385115		
40226039002	S2	EPA 9060	385114		

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: ECHO LAKE
 Pace Project No.: 40226039

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40226039002	S2	EPA 9060	385115		
40226039004	S4	EPA 9060	385114		
40226039004	S4	EPA 9060	385115		
40226039005	S5	EPA 9060	385114		
40226039005	S5	EPA 9060	385115		

REPORT OF LABORATORY ANALYSIS

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Sample Preservation Receipt Form

Client Name: Ayres

All containers needing preservation have been checked and noted below: Yes No N/A

Project # 40226039

Pace Analytical Services, LLC
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Initial when completed:

Date/
Time:

Lab Lot# of pH paper:

Lab Std #/ID of preservation (if pH adjusted):

Pace Lab #	Glass					Plastic					Vials					Jars			General			VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)	
	AG1U	BG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	VG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN			
001																	2	2		1							2.5 / 5 / 10		
002																2	2			1								2.5 / 5 / 10	
003																		1										2.5 / 5 / 10	
004																2	2		1									2.5 / 5 / 10	
005																2	2		1									2.5 / 5 / 10	
006																	1												2.5 / 5 / 10
007																													2.5 / 5 / 10
008																													2.5 / 5 / 10
009																													2.5 / 5 / 10
010																													2.5 / 5 / 10
011																													2.5 / 5 / 10
012																													2.5 / 5 / 10
013																													2.5 / 5 / 10
014																													2.5 / 5 / 10
015																													2.5 / 5 / 10
016																													2.5 / 5 / 10
017																													2.5 / 5 / 10
018																													2.5 / 5 / 10
019																													2.5 / 5 / 10
020																													2.5 / 5 / 10

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other:

Headspace in VOA Vials (>6mm) : Yes No N/A *If yes look in headspace column

AG1U	1 liter amber glass	BP1U	1 liter plastic unpres	VG9A	40 mL clear ascorbic	JGFU	4 oz amber jar unpres
BG1U	1 liter clear glass	BP3U	250 mL plastic unpres	DG9T	40 mL amber Na Thio	JG9U	9 oz amber jar unpres
AG1H	1 liter amber glass HCL	BP3B	250 mL plastic NaOH	VG9U	40 mL clear vial unpres	WGFU	4 oz clear jar unpres
AG4S	125 mL amber glass H2SO4	BP3N	250 mL plastic HNO3	VG9H	40 mL clear vial HCL	WPFU	4 oz plastic jar unpres
AG4U	120 mL amber glass unpres	BP3S	250 mL plastic H2SO4	VG9M	40 mL clear vial MeOH	SP5T	120 mL plastic Na Thiosulfate
AG5U	100 mL amber glass unpres			VG9D	40 mL clear vial DI	ZPLC	ziploc bag
AG2S	500 mL amber glass H2SO4					GN	
BG3U	250 mL clear glass unpres						



Document Name:
Sample Condition Upon Receipt (SCUR)

Document Revised: 26Mar2020

Document No.:
ENV-FRM-GBAY-0014-Rev.00

Author:
Pace Green Bay Quality Office

Sample Condition Upon Receipt Form (SCUR)

Project #:

Client Name: Ayres

Courier: CS Logistics Fed Ex Speedee UPS Waltco

Client Pace Other: _____

WO# : **40226039**



40226039

Tracking #:

Custody Seal on Cooler/Box Present: yes no Seals intact: yes no

Custody Seal on Samples Present: yes no Seals intact: yes no

Packing Material: Bubble Wrap Bubble Bags None Other

Thermometer Used SR - 92 Type of Ice: Wet Blue Dry None Samples on ice, cooling process has begun

Cooler Temperature Uncorr: 5 /Corr: 5

Person examining contents:

Date: 4/30/21 /Initials: CG

Temp Blank Present: yes no

Biological Tissue is Frozen: yes no

Labeled By Initials: CG

Temp should be above freezing to 6°C.

Biota Samples may be received at ≤ 0°C if shipped on Dry Ice.

Chain of Custody Present:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody Filled Out:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	2. project#, pg#, analysis not checked (4/30/2021)
Chain of Custody Relinquished:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler Name & Signature on COC:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time: - VOA Samples frozen upon receipt	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Date/Time:
Short Hold Time Analysis (<72hr):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	6.
Rush Turn Around Time Requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	7.
Sufficient Volume: For Analysis: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No MS/MSD: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A		8.
Correct Containers Used: -Pace Containers Used: -Pace IR Containers Used:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	9.
Containers Intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10.
Filtered volume received for Dissolved tests	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	12.
Trip Blank Present:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	13.
Trip Blank Custody Seals Present	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution:

If checked, see attached form for additional comments

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample log in

Echo Lake Sediment Sampling - Planned Samples include all highlighted fields.

Table 1. Sediment Sampling Parameters with Suggested Methods and Analyses

Parameter	Suggested Analytical Method (Suggested Detection Level) (mg/kg, dry weight unless noted)	Suggested Base Parameter Analyses ¹	
		Great Lakes or Urban/Industrial	Inland Waters (Rural/Forested)
Inorganics – Metals			
Arsenic	SW-846 3050B/6010B EPA 6010 or 7060 (5)	X	X
Barium	SW-846 3050B/6010B (0.2)		
Cadmium	SW-846 3050B/6010B EPA 7131 (0.6)	X	X
Chromium (total)	SW-846 3050B/6010B EPA 6010 or 7191 (0.6)	X	X
Copper	SW-846 3050B/6010B EPA 6010 or 7211 (0.5)	X	X
Cyanide	SW-846 9010B/9014 (0.4)		
Lead	SW-846 3050B/6010B EPA 6010 or 7421 (3)	X	X
Manganese	SW-846 3050B/6010B (0.1)		
Mercury	SW-846 7471A EPA 7471 (0.015)	X	X
Nickel	SW-846 3050B/6010B EPA 6010 (2)	X	X
Selenium	SW-846 3050B/6010B (8)	X	
Zinc	SW-846 3050B/6010B EPA 6010 or 7951 (2)	X	X
Inorganics – Nutrients			
Oil & Grease	SW-846 9070	X	
Total Phosphorus	EPA 365.2/365.3 or USGS I-6600-85 (9.9)	X	X
Nitrate + Nitrite	LACHAT 12-107-04-1-B (0.25)	X	X
Ammonia-Nitrogen	LACHAT 12-107-06-1-A (0.16)	X	X
Total Kjeldahl Nitrogen		X	X
Organics			
Aldrin	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		
Chlordane	SW-846 8081 EPA 8081, 354440B, 3541 (0.009)	X	
Dieldrin	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		
Endrin	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		
Heptachlor	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		
Lindane (Gamma BHC)	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)		

¹ Suggested base parameter list reflects additions to NR347 Table 1, based on scientific research and experience with dredging projects.

Parameter	Suggested Analytical Method (Suggested Detection Level) (mg/kg, dry weight unless noted)	Suggested Base Parameter Analyses ¹	
		Great Lakes or Urban/Industrial	Inland Waters (Rural/Forested)
DDT	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)	X	
DDD & DDE	SW-846 8081 EPA 8081, 354440B, 3541 (0.01)	X	
Toxaphene	SW-846 8081 (0.01)		
PCBs (Total)	SW-846 8081 EPA 8081, 3540B, 3541 (0.04)	X	X
		Tied to Fish Advisories	
2,3,7,8-dioxin, 2,3,7,8-furan and 15 2,3,7,8-substituted dioxin and furan congeners	EPA 8290 (1 – 10 pg/g)		
Total Organic Carbon	SW 846 8081 SW846-EPA 9060 (0.2%)	X	X
Polycyclic Aromatic Hydrocarbons (PAHs)	EPA 8310	X	
Naphthalene	(0.019)		
Phenanthrene	(0.017)		
Pyrene	(0.012)		
Fluorene	(0.058)		
2-Methylnaphthalene			
Acenaphthene	(0.017)		
Acenaphthylene	(0.021)		
Anthracene	(0.0071)		
Benzo (a) anthracene	(0.019)		
Benzo (a) pyrene	(0.023)		
Benzo (e) pyrene			
Benzo (b) fluoranthene	(0.032)		
Benzo (g,h,i) perylene	(0.022)		
Benzo (k) fluoranthene	(0.021)		
Chrysene	(0.0074)		
Dibenzo(a,h)anthracene	(0.008)		
Fluoranthene	(0.029)		
Indeno (1,2,3-cd) pyrene	(0.034)		
Physical Tests			
Particle Size Analysis – Sieve and Hydrometer Analysis	ASTM D-422 (%)	X	X
Moisture Content	ASTM D-2216 (%)	X	X
Atterburg Limits (Liquid Limit and Plastic Limit)	ASTM D4318 (as moisture content)		
Specific Gravity	ASTM D-854 (Ratio, unitless)		



Formerly Inter-Mountain Laboratories

1673 Terra Avenue Sheridan, WY 82801

ph: (307) 672-8945

Date: 5/13/2021

CLIENT: Pace Analytical Green Bay
Project: 40226039 ECHO LAKE
Lab Order: S2105012

CASE NARRATIVE

Report ID: S2105012001

Samples S1, S2, S4 and S5 were received on May 3, 2021.

Samples were analyzed using the methods outlined in the following references:

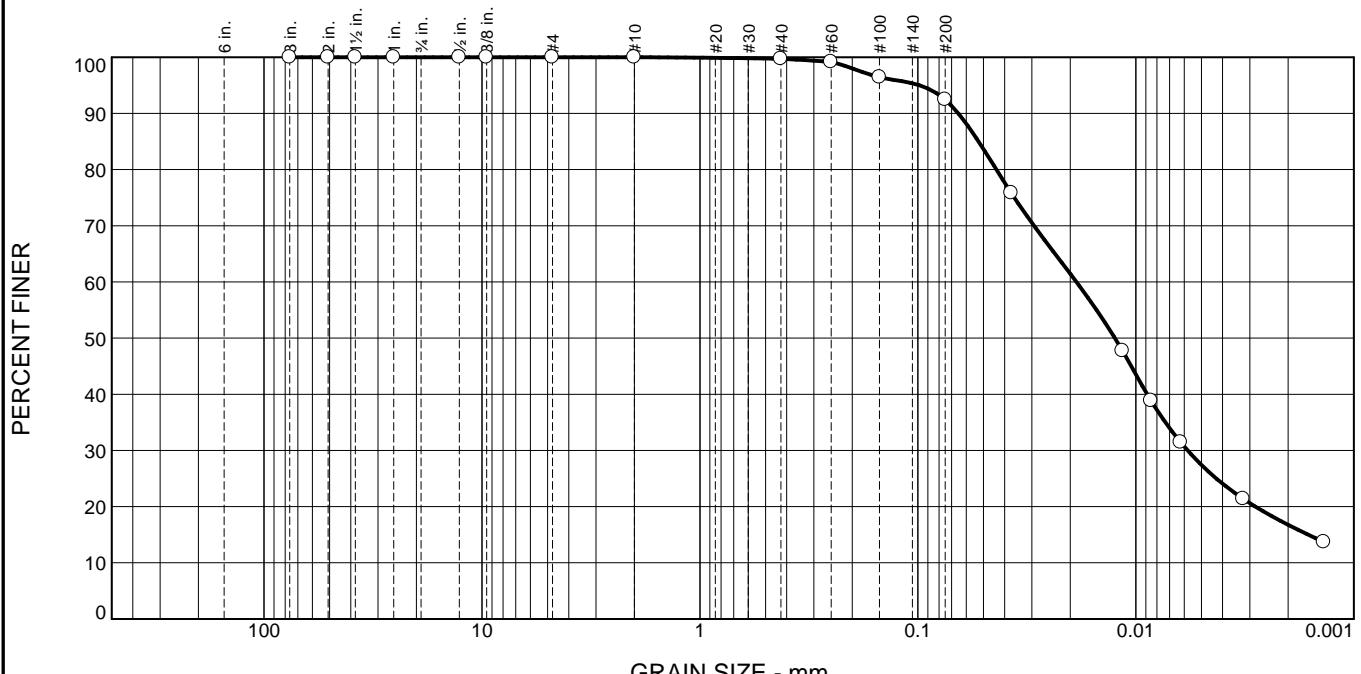
U.S.E.P.A. 600/2-78-054 "Field and Laboratory Methods Applicable to Overburden and Mining Soils", 1978
American Society of Agronomy, Number 9, Part 2, 1982
USDA Handbook 60 "Diagnosis and Improvement of Saline and Alkali Soils", 1969
Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 1, 1984
New Mexico Overburden and Soils Inventory and Handling Guideline, March 1987
State of Utah, Division of Oil, Gas, and Mining: Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, April 1988
Montana Department of State Lands, Reclamation Division: Soil, Overburden, and Regraded Spoil Guidelines, December 1994
State of Nevada Modified Sobek Procedure
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

All Quality Control parameters met the acceptance criteria defined by EPA and Pace Analytical (Formerly Inter-Mountain Laboratories) except as indicated in this case narrative.

Reviewed by:

Steve Kasa, Mining Lab Supervisor

Particle Size Distribution Report



% +3"	% Gravel		% Sand		% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt
	0.0	0.0	0.0	0.3	7.3	65.0

TEST RESULTS (ASTM D 422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
0.5	100.0		
.375	100.0		
#4	100.0		
#10	100.0		
#40	99.7		
#60	99.2		
#100	96.4		
#200	92.4		
0.0373 mm.	75.8		
0.0115 mm.	47.7		
0.0085 mm.	38.8		
0.0062 mm.	31.4		
0.0032 mm.	21.4		
0.0014 mm.	13.7		

* (no specification provided)

Material Description			
S1: silt			
<u>Atterberg Limits (ASTM D 4318)</u>			
PL= NP	LL= NV	PI=	
<u>Classification</u>			
USCS (D 2487)=	ML	AASHTO (M 145)=	A-4(0)
<u>Coefficients</u>			
D ₉₀ = 0.0653	D ₈₅ = 0.0527	D ₆₀ = 0.0187	
D ₅₀ = 0.0125	D ₃₀ = 0.0058	D ₁₅ = 0.0016	
D ₁₀ =	C _u =	C _c =	
Remarks			
Date Received: 5/3/2021 Date Tested: 5/13/2021			
Tested By: Steve Holzerland			
Checked By: Brandon Sadler			
Title:			

Sample Number: S2105012-001A

Date Sampled: 4/29/2021

Pace Analytical Services, Inc.

Client: Pace Analytical Green Bay
Project: 40226039 ECHO LAKE

Sheridan, Wyoming

Project No: S2105012

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

5/13/2021

Client: Pace Analytical Green Bay

Project: 40226039 ECHO LAKE

Project Number: S2105012

Sample Number: S2105012-001A

Material Description: S1: silt

Sample Date: 4/29/2021

Date Received: 5/3/2021 **PL:** NP

LL: NV

USCS Classification: ML

AASHTO Classification: A-4(0)

Grain Size Test Method: ASTM D 422

Tested By: Steve Holzerland

Test Date: 5/13/2021

Checked By: Brandon Sadler

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
520.30	0.00	3	0.00	0.00	100.0
		2	0.00	0.00	100.0
		1.5	0.00	0.00	100.0
		1	0.00	0.00	100.0
		0.5	0.00	0.00	100.0
		.375	0.00	0.00	100.0
		#4	0.00	0.00	100.0
		#10	0.00	0.00	100.0
62.49	0.00	#40	0.17	0.00	99.7
		#60	0.35	0.00	99.2
		#100	1.70	0.00	96.4
		#200	2.50	0.00	92.4

Hydrometer Test Data

Hydrometer test uses material passing #200

Percent passing #200 based upon complete sample = 92.4

Weight of hydrometer sample = 62.49

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -3.5

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation: $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	19.0	55.0	51.3	0.0138	55.0	7.3	0.0373	75.8
15.00	19.0	36.0	32.3	0.0138	36.0	10.4	0.0115	47.7
30.00	19.0	30.0	26.3	0.0138	30.0	11.4	0.0085	38.8
60.00	19.0	25.0	21.3	0.0138	25.0	12.2	0.0062	31.4
240.00	20.0	18.0	14.5	0.0136	18.0	13.3	0.0032	21.4
1440.00	19.0	13.0	9.3	0.0138	13.0	14.2	0.0014	13.7

Pace Analytical Services, Inc.

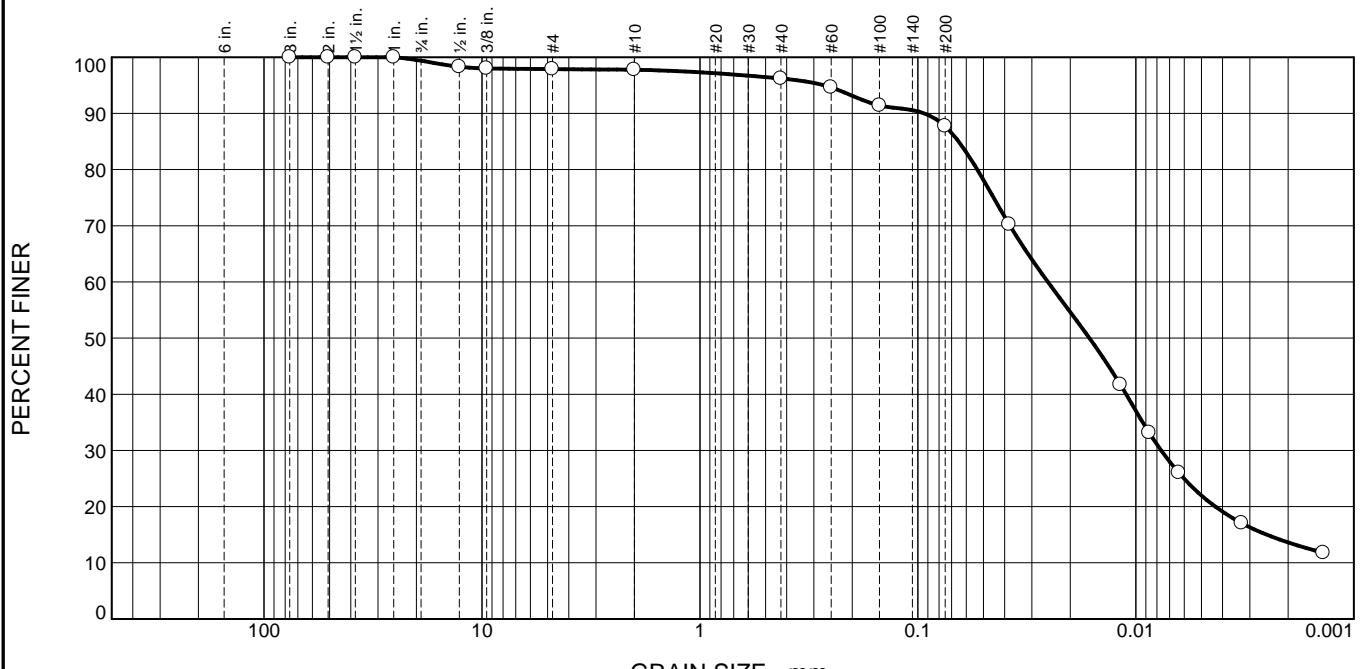
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	0.3	7.3	7.6	65.0	27.4	92.4

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
		0.0016	0.0028	0.0058	0.0089	0.0125	0.0187	0.0436	0.0527	0.0653	0.0980

Fineness Modulus
0.04

Particle Size Distribution Report



% +3"	% Gravel		% Sand		% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt
	0.0	0.6	0.1	1.6	8.5	65.7
						Clay
						22.0

TEST RESULTS (ASTM D 422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
0.5	98.3		
.375	98.0		
#4	97.9		
#10	97.8		
#40	96.2		
#60	94.6		
#100	91.4		
#200	87.7		
0.0381 mm.	70.2		
0.0118 mm.	41.7		
0.0087 mm.	33.2		
0.0064 mm.	26.0		
0.0033 mm.	17.1		
0.0014 mm.	11.8		

* (no specification provided)

Material Description			
S2: silt			
<u>Atterberg Limits (ASTM D 4318)</u>			
PL= NP	LL= NV	PI=	
<u>Classification</u>			
USCS (D 2487)=	ML	AASHTO (M 145)=	A-4(0)
<u>Coefficients</u>			
D ₉₀ = 0.0933	D ₈₅ = 0.0650	D ₆₀ = 0.0253	
D ₅₀ = 0.0163	D ₃₀ = 0.0077	D ₁₅ = 0.0025	
D ₁₀ =	C _u =	C _c =	
Remarks			
Date Received: 5/3/2021		Date Tested: 5/13/2021	
Tested By: Steve Holzerland			
Checked By: Brandon Sadler			
Title:			

Sample Number: S2105012-002A

Date Sampled: 4/29/2021

Pace Analytical Services, Inc.

Client: Pace Analytical Green Bay
Project: 40226039 ECHO LAKE

Sheridan, Wyoming

Project No: S2105012

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

5/13/2021

Client: Pace Analytical Green Bay

Project: 40226039 ECHO LAKE

Project Number: S2105012

Sample Number: S2105012-002A

Material Description: S2: silt

Sample Date: 4/29/2021

Date Received: 5/3/2021 **PL:** NP

LL: NV

USCS Classification: ML

AASHTO Classification: A-4(0)

Grain Size Test Method: ASTM D 422

Tested By: Steve Holzerland

Test Date: 5/13/2021

Checked By: Brandon Sadler

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
917.40	0.00	3	0.00	0.00	100.0
		2	0.00	0.00	100.0
		1.5	0.00	0.00	100.0
		1	0.00	0.00	100.0
		0.5	15.60	0.00	98.3
		.375	2.80	0.00	98.0
		#4	1.00	0.00	97.9
		#10	0.90	0.00	97.8
61.53	0.00	#40	0.99	0.00	96.2
		#60	1.00	0.00	94.6
		#100	2.02	0.00	91.4
		#200	2.32	0.00	87.7

Hydrometer Test Data

Hydrometer test uses material passing #200

Percent passing #200 based upon complete sample = 87.7

Weight of hydrometer sample = 61.53

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -3.5

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation: $L = 16.294964 - 0.164 \times Rm$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	19.0	53.0	49.3	0.0138	53.0	7.6	0.0381	70.2
15.00	19.0	33.0	29.3	0.0138	33.0	10.9	0.0118	41.7
30.00	19.0	27.0	23.3	0.0138	27.0	11.9	0.0087	33.2
60.00	19.0	22.0	18.3	0.0138	22.0	12.7	0.0064	26.0
240.00	20.0	15.5	12.0	0.0136	15.5	13.8	0.0033	17.1
1440.00	19.0	12.0	8.3	0.0138	12.0	14.3	0.0014	11.8

Pace Analytical Services, Inc.

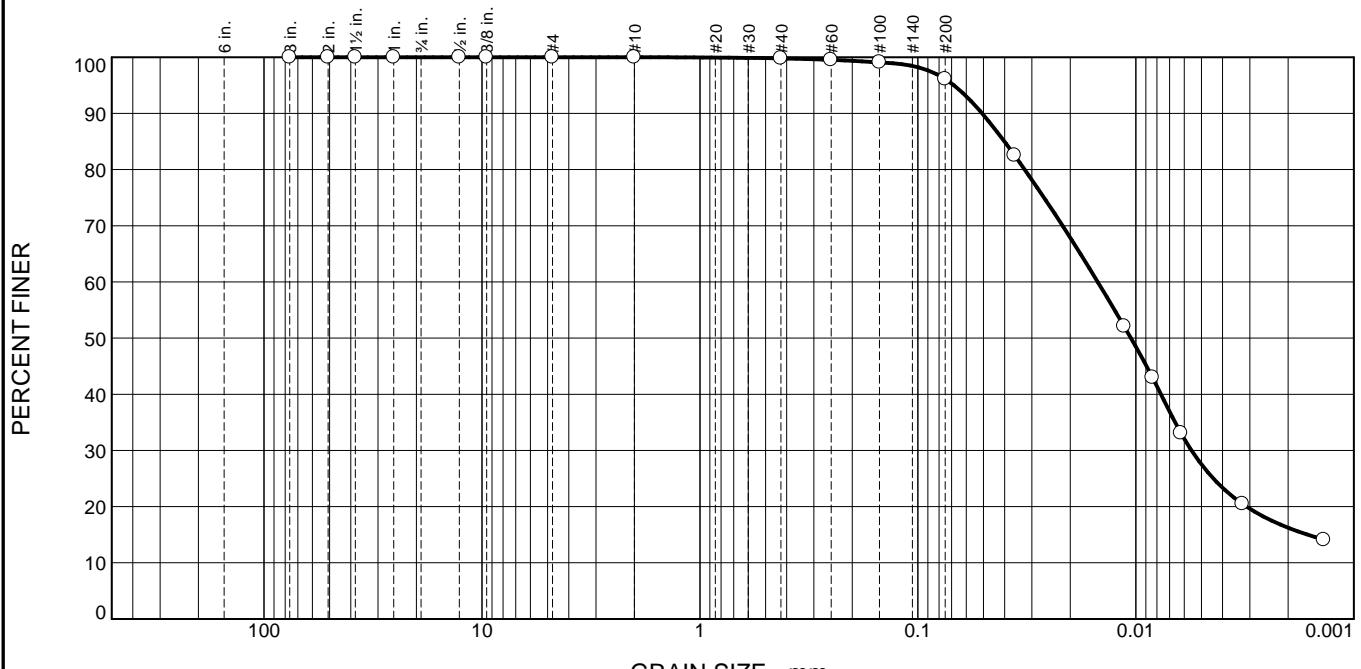
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.6	1.5	2.1	0.1	1.6	8.5	10.2	65.7	22.0	87.7

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
		0.0025	0.0043	0.0077	0.0111	0.0163	0.0253	0.0534	0.0650	0.0933	0.2690

Fineness Modulus
0.26

Particle Size Distribution Report



% +3"	% Gravel		% Sand		% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt
	0.0	0.0	0.0	0.2	3.7	68.6

TEST RESULTS (ASTM D 422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
0.5	100.0		
.375	100.0		
#4	100.0		
#10	100.0		
#40	99.8		
#60	99.5		
#100	99.1		
#200	96.1		
0.0360 mm.	82.5		
0.0113 mm.	52.1		
0.0084 mm.	43.0		
0.0062 mm.	33.1		
0.0032 mm.	20.5		
0.0014 mm.	14.1		

* (no specification provided)

Material Description			
S4: silt			
<u>Atterberg Limits (ASTM D 4318)</u>			
PL= NP	LL= NV	PI=	
<u>Classification</u>			
USCS (D 2487)=	ML	AASHTO (M 145)=	A-4(0)
<u>Coefficients</u>			
D ₉₀ = 0.0507	D ₈₅ = 0.0401	D ₆₀ = 0.0150	
D ₅₀ = 0.0105	D ₃₀ = 0.0056	D ₁₅ = 0.0016	
D ₁₀ =	C _u =	C _c =	
Remarks			
Date Received: 5/3/2021 Date Tested: 5/13/2021			
Tested By: Steve Holzerland			
Checked By: Brandon Sadler			
Title:			

Sample Number: S2105012-003A

Date Sampled: 4/29/2021

Pace Analytical Services, Inc.

Client: Pace Analytical Green Bay
Project: 40226039 ECHO LAKE

Sheridan, Wyoming

Project No: S2105012

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

5/13/2021

Client: Pace Analytical Green Bay

Project: 40226039 ECHO LAKE

Project Number: S2105012

Sample Number: S2105012-003A

Material Description: S4: silt

Sample Date: 4/29/2021

Date Received: 5/3/2021 **PL:** NP

LL: NV

USCS Classification: ML

AASHTO Classification: A-4(0)

Grain Size Test Method: ASTM D 422

Tested By: Steve Holzerland

Test Date: 5/13/2021

Checked By: Brandon Sadler

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
371.00	0.00	3	0.00	0.00	100.0
		2	0.00	0.00	100.0
		1.5	0.00	0.00	100.0
		1	0.00	0.00	100.0
		0.5	0.00	0.00	100.0
		.375	0.00	0.00	100.0
		#4	0.00	0.00	100.0
		#10	0.00	0.00	100.0
63.20	0.00	#40	0.13	0.00	99.8
		#60	0.16	0.00	99.5
		#100	0.29	0.00	99.1
		#200	1.87	0.00	96.1

Hydrometer Test Data

Hydrometer test uses material passing #200

Percent passing #200 based upon complete sample = 96.1

Weight of hydrometer sample = 63.2

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -3.5

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation: $L = 16.294964 - 0.164 \times Rm$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	19.0	58.0	54.3	0.0138	58.0	6.8	0.0360	82.5
15.00	19.0	38.0	34.3	0.0138	38.0	10.1	0.0113	52.1
30.00	19.0	32.0	28.3	0.0138	32.0	11.0	0.0084	43.0
60.00	19.0	25.5	21.8	0.0138	25.5	12.1	0.0062	33.1
240.00	20.0	17.0	13.5	0.0136	17.0	13.5	0.0032	20.5
1440.00	19.0	13.0	9.3	0.0138	13.0	14.2	0.0014	14.1

Pace Analytical Services, Inc.

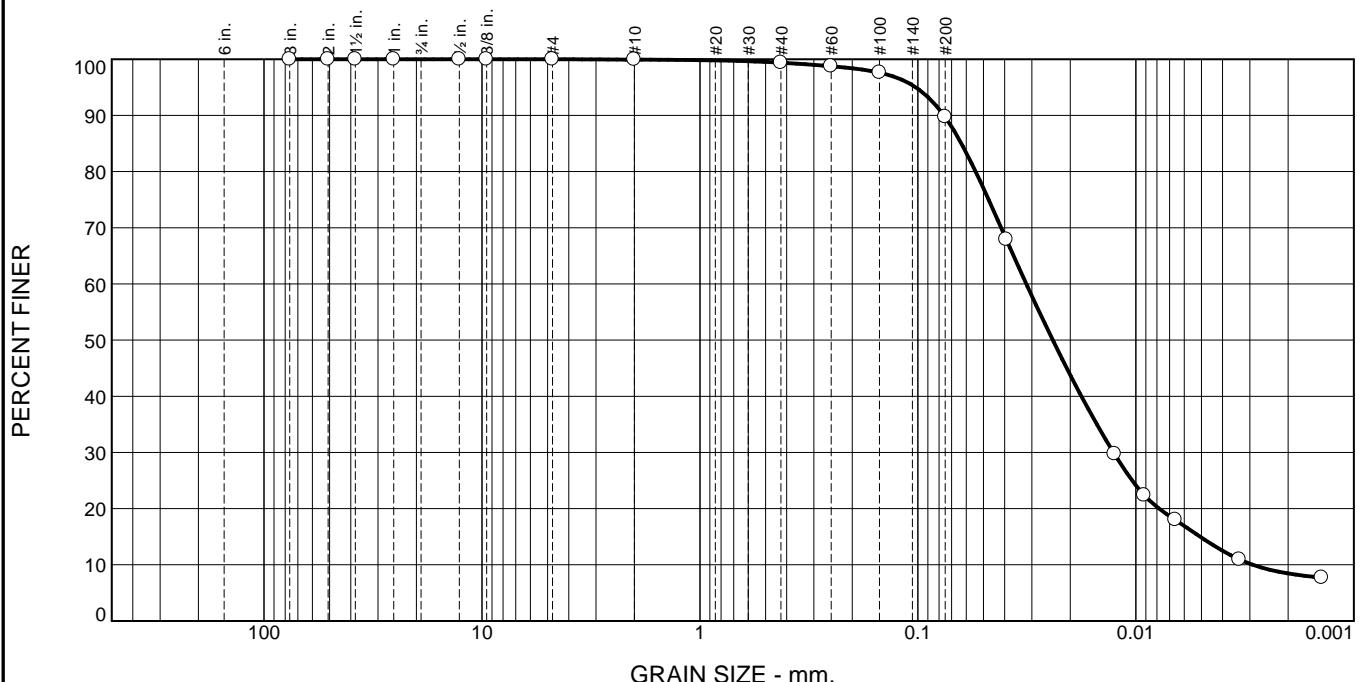
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	0.2	3.7	3.9	68.6	27.5	96.1

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
		0.0016	0.0031	0.0056	0.0077	0.0105	0.0150	0.0324	0.0401	0.0507	0.0684

Fineness Modulus
0.01

Particle Size Distribution Report



% +3"	% Gravel		% Sand		% Fines		
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.5	9.7	74.9	14.8

TEST RESULTS (ASTM D 422)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
0.5	100.0		
.375	100.0		
#4	100.0		
#10	99.9		
#40	99.4		
#60	98.8		
#100	97.6		
#200	89.7		
0.0393 mm.	67.9		
0.0125 mm.	29.7		
0.0092 mm.	22.4		
0.0066 mm.	18.0		
0.0034 mm.	11.0		
0.0014 mm.	7.7		

* (no specification provided)

Material Description			
S5: silt			
<u>Atterberg Limits (ASTM D 4318)</u>			
PL= NP	LL= NV	PI=	
<u>Classification</u>			
USCS (D 2487)=	ML	AASHTO (M 145)=	A-4(0)
<u>Coefficients</u>			
D ₉₀ = 0.0759	D ₈₅ = 0.0632	D ₆₀ = 0.0318	
D ₅₀ = 0.0240	D ₃₀ = 0.0127	D ₁₅ = 0.0051	
D ₁₀ = 0.0029	C _u = 10.93	C _c = 1.73	
<u>Remarks</u>			
Date Received: 5/3/2021 Date Tested: 5/13/2021			
Tested By: Steve Holzerland			
Checked By: Brandon Sadler			
Title:			

Sample Number: S2105012-004A

Date Sampled: 4/29/2021

Pace Analytical Services, Inc.

Client: Pace Analytical Green Bay
Project: 40226039 ECHO LAKE

Sheridan, Wyoming

Project No: S2105012

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

5/13/2021

Client: Pace Analytical Green Bay

Project: 40226039 ECHO LAKE

Project Number: S2105012

Sample Number: S2105012-004A

Material Description: S5: silt

Sample Date: 4/29/2021

Date Received: 5/3/2021 **PL:** NP

LL: NV

USCS Classification: ML

AASHTO Classification: A-4(0)

Grain Size Test Method: ASTM D 422

Tested By: Steve Holzerland

Test Date: 5/13/2021

Checked By: Brandon Sadler

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
570.30	0.00	3	0.00	0.00	100.0
		2	0.00	0.00	100.0
		1.5	0.00	0.00	100.0
		1	0.00	0.00	100.0
		0.5	0.00	0.00	100.0
		.375	0.00	0.00	100.0
		#4	0.00	0.00	100.0
		#10	0.40	0.00	99.9
61.10	0.00	#40	0.33	0.00	99.4
		#60	0.39	0.00	98.8
		#100	0.70	0.00	97.6
		#200	4.82	0.00	89.7

Hydrometer Test Data

Hydrometer test uses material passing #200

Percent passing #200 based upon complete sample = 89.7

Weight of hydrometer sample = 61.1

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -3.5

Meniscus correction only = 0.0

Specific gravity of solids = 2.65

Hydrometer type = 152H

Hydrometer effective depth equation: $L = 16.294964 - 0.164 \times Rm$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	19.0	50.0	46.3	0.0138	50.0	8.1	0.0393	67.9
15.00	19.0	24.0	20.3	0.0138	24.0	12.4	0.0125	29.7
30.00	19.0	19.0	15.3	0.0138	19.0	13.2	0.0092	22.4
60.00	19.0	16.0	12.3	0.0138	16.0	13.7	0.0066	18.0
240.00	20.0	11.0	7.5	0.0136	11.0	14.5	0.0034	11.0
1440.00	19.0	9.0	5.3	0.0138	9.0	14.8	0.0014	7.7

Pace Analytical Services, Inc.

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.1	0.5	9.7	10.3	74.9	14.8	89.7

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
	0.0029	0.0051	0.0078	0.0127	0.0178	0.0240	0.0318	0.0543	0.0632	0.0759	0.1022

Fineness Modulus	C _u	C _c
0.04	10.93	1.73

Internal Transfer Chain of Custody



Samples Pre-Logged into eCOC.

Pace Analytical
www.pacalabs.com

Workorder: 40226039 Workorder Name: ECHO LAKE
Report To: Subcontract To:

State Of Origin: WI
Cert. Needed: Yes No
Owner Received Date: 4/30/2021 Results Requested By: 5/14/2021

Dan Milewsky
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Phone (920)469-2436

Pace Analytical Sheridan WY
1673 Terra Avenue
Sheridan, WY 82801
Phone (307)672-8945

ASTM D422 Sieve & Hydrometer

Item	Sample ID	Sample Type	Collect Date/Time	Lab ID	Matrix	Preserved Containers						LAB USE ONLY
						1	2	3	4	5	6	
1	S1	PS	4/29/2021 13:00	40226039001	Solid	1					X	
2	S2	PS	4/29/2021 13:00	40226039002	Solid	1					X	
3	S4	PS	4/29/2021 13:00	40226039004	Solid	1					X	
4	S5	PS	4/29/2021 13:00	40226039005	Solid	1					X	
5												

Transfers	Released By	Date/Time	Received By	Comments					
				Date/Time	Received By	Comments	Comments	Comments	Comments
1	Milewsky	4/30/2021 14:00	J. Hause						
2									
3									

Cooler Temperature on Receipt °C Custody Seal Y or N

Received on Ice Y or N Samples Intact Y or N

***In order to maintain client confidentiality, location/name of the sampling site, sampler's name and signature may not be provided on this COC document.
This chain of custody is considered complete as is since this information is available in the owner laboratory.

Summary of Soil Analytical Results
Echo Lake Pre-Dredging Study

Parameter	CAS	Samples						NR 720 WDNR Spreadsheet RCLs			
		1 Lake Bed	2 Sediment	3 Sediment	4 Lake Bed	5 Sediment	6 Sediment	Non-industrial Direct Contact	Industrial Direct Contact	Protection of Ground Water	Back Ground Threshold Value
		Date	4/29/21	4/29/21	4/29/21	4/29/21	4/29/21	4/29/21			
		Soil Type	Silt	Silt	n/a	Silt	Silt	n/a			
Metals											
Arsenic	7440-38-2	6.5	7.0	---	5.5	8.0	---	0.677	3	0.584	8
Barium	7440-39-3	134	97.0	---	134	109	---	15,300	100,000	164.8	364
Cadmium	7440-43-9	<i>1.2 J</i>	<i>1.3 J</i>	---	0.58 J	0.48 J	---	71.1	985	0.752	1
Chromium	7440-47-3	24.8	51.1	---	23.7	26.9	---	100,000	100,000	360,000	44
Copper	7440-50-8	15.8	15.1	---	16.5	16.1	---	3,130	46,700	92	35
Lead	7439-92-1	18.7	18.1	---	24.3	26.9	---	400	800	27	52
Manganese	7439-96-5	744	477	---	654	473	---	1,830	---	---	2,937
Mercury	7439-97-6	0.17	0.18	---	<i>0.21</i>	0.19	---	3.13	3.13	0.208	---
Nickel	91-20-3	16.9	<i>56.6</i>	---	16.6	27.5	---	1,550	22,500	13.061	31
Selenium	7782-49-2	<i>3.7</i>	<i>3.1</i>	---	<i>2.9</i>	<i>2.7</i>	---	391	5,840	0.52	---
Zinc	7440-66-6	74.7	63.5	---	79.6	76.0	---	23,500	100,000	---	150
Nutrients											
Phosphorus	7723-14-0	965	1330	1710	738	803	873	---	---	---	---
Nitrogen, Ammonia	7664-41-7	293	621	---	468	264	---	---	---	---	---
Nitrogen, Kjeldahl, Total	7727-37-9	4380	5090	---	4360	4000	---	---	---	---	---
Mean Total Organic Carbon	7440-44-0	46900	66200	---	52400	46300	---	---	---	---	---
Total Organic Carbon	7440-44-0	48000	78200	---	55300	47400	---	---	---	---	---
Polychlorinated Biphenyls (PCBs)											
PCB, Total	1336-36-3	<0.0319	<0.0400	---	<0.0304	<0.0309	---	---	---	---	---
PCB-1016 (Aroclor 1016)	12674-11-2	<0.0319	<0.0400	---	<0.0304	<0.0309	---	4.11	51.30	---	---
PCB-1221 (Aroclor 1221)	11104-28-2	<0.0319	<0.0400	---	<0.0304	<0.0309	---	---	---	---	---
PCB-1232 (Aroclor 1232)	11141-16-5	<0.0319	<0.0400	---	<0.0304	<0.0309	---	---	---	---	---
PCB-1242 (Aroclor 1242)	53469-21-9	<0.0319	<0.0400	---	<0.0304	<0.0309	---	---	---	---	---
PCB-1248 (Aroclor 1248)	12672-29-6	<0.0319	<0.0400	---	<0.0304	<0.0309	---	---	---	---	---
PCB-1254 (Aroclor 1254)	11097-69-1	<0.0319	<0.0400	---	<0.0304	<0.0309	---	1.17	14.70	---	---
PCB-1260 (Aroclor 1260)	11096-82-5	<0.0319	<0.0400	---	<0.0304	<0.0309	---	---	---	---	---
Polycyclic Aromatic Hydrocarbons (PAHs)											
1-Methylnaphthalene	90-12-0	<0.0051	<0.0064	---	0.0243 J	<0.0050	---	4,180	52,700	---	---
Acenaphthene	83-32-9	<0.0045	<0.0057	---	<0.0043	<0.0044	---	3,590	45,200	---	---
Acenaphthylene	208-96-8	<0.0044	<0.0055	---	0.0055 J	<0.0043	---	---	---	---	---
Anthracene	120-12-7	<0.0045	0.0241 J	---	0.0098 J	0.0350	---	17,900	100,000	196.94915	---
Benzo(a)anthracene	56-55-3	<0.0040	0.0202 J	---	0.0055 J	0.0356	---	1.14	20.8	---	---
Benzo(a)pyrene	50-32-8	<0.0049	0.0250 J	---	0.0103 J	0.0511	---	0.115	2.11	0.47	---
Benzo(b)fluoranthene	205-99-2	<0.0041	0.0143 J	---	0.0055 J	0.0258 J	---	1.15	21.1	0.4780876	---
Benzo(g,h,i)perylene	191-24-2	<0.0061	0.0129 J	---	<0.0059	0.0234 J	---	---	---	---	---
Benzo(k)fluoranthene	207-08-9	<0.0045	0.0137 J	---	0.0045 J	0.0182 J	---	11.5	211	---	---
Chrysene	218-01-9	<0.0066	0.0248 J	---	0.0095 J	0.0402	---	115	2110	0.1442231	---
Dibenz(a,h)anthracene	53-70-3	<0.0048	<0.0061	---	<0.0046	0.0074 J	---	0.115	2.11	---	---
Fluoranthene	206-44-0	<0.0041	0.0548	---	0.0282 J	0.0859	---	2,390	30,100	88.877805	---
Fluorene	86-73-7	<0.0042	<0.0052	---	0.0094 J	<0.0041	---	2,390	30,100	14.829932	---
Indeno(1,2,3-cd)pyrene	193-39-5	<0.0073	0.0115 J	---	<0.0070	0.0220 J	---	1.15	21.1	---	---
Naphthalene	91-20-3	<0.0034	<0.0043	---	0.0232 J	<0.0033	---	5.52	24.1	0.6581818	---
Phenanthrene	85-01-8	<0.0040	0.0328 J	---	0.0242 J	0.0386	---	---	---	---	---
Pyrene	129-00-0	<0.0051	0.0450	---	0.0223 J	0.0697	---	1,790	22,600	54.545455	---
Cumulative Risk Calculation (Non-Industrial Direct Contact)											
Exceedances	0	0	---	0	0	---	1	1	---	---	---
Hazard Index	0.0724	0.1193	---	0.0546	0.0550	---	1	1	---	---	---
Cancer Risk	1.1E-06	1.5E-06	---	1.1E-06	1.1E-04	---	1.00E-05	1.00E-05	---	---	---

Notes:

Samples 3 and 6 only analyzed for Phosphorus
J = Estimated concentration at or above the Limit of Detection and below the Limit of Quantification
< = less than detection limit (analyte not detected)
Groundwater RCL exceedances are in *Italic red* font
Non-Industrial Direct Contact RCL exceedances are in **bold red** font
Industrial RCL exceedances are boxed.



Phosphorus Load Estimate

May-21

Project: Echo Lake Pre-Dredging Study
Client: City of Burlington
Location: Racine County, WI
Project No.: 26-1258.00

References: 1.) *Earth Manual*. US Department of Interior. Third Edition. 1998.

Dredge volume estimate 115,231 cy (average of 33/200kHz sediment surfaces)

Avg sediment density 2,018 kg/m³ (average value from "Earth Manual" correlating to testing results)

Phosphorus in sediment 1,281 mg/kg (average of 3 sediment samples within dredge area (not lake bed samples))

Phosphorus Load Estimate Calculation	115,231 cy	x	0.764554858 m ³ /cy	=	88,100.42 m ³
	88,100.42 m ³	x	2,018 kg/m ³	=	177,786,649.26 kg
	177,786,649.26 kg	x	1,281 mg/kg	=	227,744,697,701.49 mg
	227,744,697,701.49 mg	x	0.000002204 lb/mg	=	501,949.31 lb of phosphorus in sediment

Conversions

1 cy = 0.764554858 m³/cy

1 mg = 0.000002204 mg/lbs